UNITED STATES DISTRICT COURT

FOR THE DISTRICT OF DELAWARE

UNITED STATES OF AMERICA	)	
	)	
Plaintiff,	)	
	)	
v.	)	Criminal Action No. 06-118-JJF
	)	
KEVIN L. PEARSALL,	)	
	)	
Defendant.	)	

DEFENDANT'S PROPOSED FINDINGS OF FACT AND CONCLUSIONS OF LAW IN OPPOSITION TO THE ADMISSION OF THE GOVERNMENT'S EVIDENCE IN RELATION TO GUNSHOT RESIDUE

Defendant Kevin Pearsall, by and through undersigned counsel, Christopher S. Koyste, proposes that this Honorable Court make the following Findings of Fact and Conclusions of Law regarding the introduction at trial of the government's expert witness opinion testimony concerning gunshot residue testing.

I. INTRODUCTION

On or about October 24, 2006 Kevin L. Pearsall was indicted and charged with a violation of 18 U.S.C.§ 922(g). Thereafter, Mr. Pearsall filed a Pretrial Motion requesting that the Court hold an evidentiary hearing pursuant to Daubert v. Merrell Dow Pharmaceuticals, Inc., 509 U.S. 579 (1993) and Fed. R. Evid. 702. Therein, Defendant contested only the admissibility of the Government's expert's conclusion that the laboratory test results support the opinion that Mr. Pearsall may have fired a gun, or was in close proximity to a gun as it was discharged. The Defense also raised the issue that the Government's expert witness testimony could be overly prejudicial pursuant to Fed. R. Evid 403.

This Court held a Scheduling Conference on January 18, 2006. At the conclusion of the

Conference, the Court directed the parties to file Proposed Findings of Fact and Conclusions of Law refining the facts and issues involved in Defendant's request for a Daubert Hearing. Mr. Pearsall, therefore submits the instant filing in compliance with this Court's Order.

II. SUMMARY OF THE ANTICIPATED EVIDENCE

A. Government's Anticipated Evidence

On August 5, 2006 at approximately 1:50 a.m. the Dover Police Department received an anonymous telephone call from an individual who alleged that she had just seen Mr. Pearsall fire a handgun several times, and then conceal it in his clothing. A short time later, the caller contacted the police department again, this time reporting that Mr. Pearsall was sitting next to a woman at a specific location in the Capital Green Apartment complex, and that he had given the gun to her.

When police officers arrived at the Capital Green Apartments to investigate, they saw a woman and two men sitting together. One of the men was Mr. Pearsall, who appeared to have consumed alcohol. The police officers saw a bulge in the woman's shorts, and immediately arrested both her and Mr. Pearsall along with the other man who was present. After the arrests, the officers searched the woman and found a 9mm Vector semiautomatic pistol in her shorts. Police Officer Kuntzi was involved in the arrest of both Mr. Pearsall and the woman.

According to Officer Kuntzi, he observed the defendant, during the booking process, complete and sign the paperwork using his right hand. Officer Kuntzi later returned to the holding cell and performed a gunshot residue "field test"[1] on Mr. Pearsall's hands. This test yielded a positive

[1] The government has not indicated that they will attempt to introduce the "field test", which the Defense believes is not admissible. In the event that the government seeks to introduce the field test, the Defense moves for its exclusion at trial since it lacks the kind of indicia of reliability as does laboratory analysis and does not indicate the presence of particles unique to gunshot residue.

result on Mr. Pearsall's right hand, indicating the presence of nitrates, which prompted Officer Kuntzi to swab Mr. Pearsall's right and left hands for gunshot residue in order to send them to the ATF for later laboratory analysis.

Prior to conducting the field test, Officer Kuntzi, who by his own admission, has never been trained or certified to conduct a gunshot residue test, had not taken any steps to preserve the integrity of the evidence in a pristine state, nor to preserve Mr. Pearsall's hands from possible contamination. In addition, prior to his placement in the Dover Police Department's holding cell, Mr. Pearsall's hands were not placed in bags by any law enforcement officer, and, therefore were exposed to contamination during his arrest, while Officer Kuntzi processed him at the station, and during the tests that Officer Kuntzi conducted. During the ride to the station and after his arrival, Mr. Pearsall's hands came into contact with numerous items that could have contained particles of gunshot residue, including police handcuffs, utility belts, and the patrol car.

The seized firearm is a semiautomatic pistol which discharges spent casings after each bullet is fired. However, no spent shell casings were recovered from Capital Green Apartments. Therefore, the police department provided no gunshot casings for laboratory analysis that could connect Mr. Pearsall with the firearm recovered at the scene. Additionally, the police department did not submit the gun itself for testing to determine whether any gunshot residue in the barrel might match any particles found on Mr. Pearsall. The officers did not test either of the other two individuals arrested with Mr. Pearsall for gunshot residue. Also, none of the clothing that Mr. Pearsall or the two people wore that night was taken into evidence by the Dover Police Department.

After swabbing Mr. Pearsall's hands, Officer Kuntzi forwarded a complete "Instant Shooter Identification-2 Kit," which contained a total of three sample swabs, to Agent David DiBetta of the

ATF. Agent DiBetta sent the swabs to RJ Lee Group, Inc. for testing. Prior to this Court's January 18, 2007 Scheduling Conference, the Government provided the Defense with RJ Lee Group's Report (See Exhibit "A") on its analysis of the three swabs. The report indicates that an analysis of the sample taken from Mr. Pearsall's left hand revealed only one particle unique to gunshot residue, and that an analysis of the right hand sample swab failed to reveal any particles unique to gunshot residue. The report does not indicate whether the Government intends to present any testimony as to whether a scientific expert could rely on these findings to conclude that Mr. Pearsall had recently fired a gun.

On January 25, 2007 the Government sent a letter to the Defense (See Exhibit "B") which contained additional documentation in relation to the RJ Lee Group Report, the Curriculum Vitae of the three signatories to the Report, and a brief summary of the Government's expert witnesses' expected testimony. The government notes in its letter that "(t)he witnesses' ultimate conclusion is that the defendant could have discharge[d] a firearm, [been] in close proximity to a discharging firearm, or had contact with a surface contaminated with GSR."

B. Defense's Anticipated Evidence

The Defense intends to present the testimony of John W. Kilty, an expert in the field of gunshot residue. Mr. Kilty was the former Chief of the FBI Laboratory, Gunshot Residue and Metals Analysis Unit. Mr. Kilty's Curriculum Vitae is attached as Exhibit "C". Mr. Kilty will first describe the science behind gunshot residue testing. He will outline how a firearm that discharges a bullet causes an explosion of primer and gunpowder which produces unique spherical particles of three elements that are fused together as a result of the explosion: antimony, lead and barium. He will note that a spherical particle containing all three of these elements is referred to as a "particle unique to gunshot residue." He will testify that laboratories will analyze the results of gunshot residue tests

using an automated scanning electron microscope to determine whether swabs taken from an individual suspected of discharging a firearm contain enough of these unique particles to support their conclusion that an individual may have recently held or discharged a firearm, or was in close proximity to a discharging firearm.

Mr. Kilty will testify how gunshot residue can be found in many environments. Additionally he will testify that the Dover Police failed to observe numerous evidence collection and maintenance protocols necessary to insure the integrity of the collected evidence, in order to avoid the potential for extraneous sources of gunshot residue to contaminate the subject. Mr. Kilty will also testify that the RJ Lee Group's opinion lacks a sufficient scientific foundation for the opinion to be reliable. Mr. Kilty will base his opinion on the lack of evidence collection protocols followed in this case, and the fact that laboratory analysis revealed only 1 particle, unique to gunshot residue, on Mr. Pearsall's left hand. Mr. Kilty will further opine that a laboratory analysis that finds only 1 particle unique to gunshot residue, under the facts of this case, is not a sufficient factual basis upon which an expert can conclude that a subject may have fired a gun, or was in close proximity to a gun as it was discharged.

In reaching his opinions, Mr. Kilty not only relied upon his own knowledge and experience, and his awareness of other laboratories criteria, he also considered and reviewed the following which are attached hereto: Summary of the FBI Laboratory's Gunshot Residue Symposium, May 31-June 3, 2005, (July 2006) (See Exhibit "D"); Illinois Trace Chemistry Procedures Manual, p. 29 - 30 (See Exhibit "E"); West Virginia State Police Laboratory Field Manual, 8th Edition. (See Exhibit "F"); Court Opinion in State v. Jason Moua, Court File No. K5-05-7335 (Anoka County Ct. July 7, 2006), (See Exhibit "G").

Mr. Kilty will describe that based upon the fact that gunshot residue does not degrade or

change, and because it is readily transferable from one surface to another, that some state, local, and federal agencies have established a threshold number of particles unique to gunshot residue that must be present before an examiner will declare a "positive" test for the presence of gunshot residue. Mr. Kilty will testify to the following: the United States Army Crime Laboratory requires the presence of at least four particles unique to gunshot residue. (See Exhibit "D", p. 6); the Illinois State Police Department requires three particles unique to gunshot residue for each swab or test site. (See Exhibit "E", p. 30). He will also clarify that, although the FBI laboratory no longer performs gunshot residue analysis, it established a threshold of three particles unique to gunshot residue. (See Exhibit "D", p. 6). Mr. Kilty will note that he is in agreement with the West Virginia State Police Laboratory Field Manual which provides no particular threshold, but warns that "the quantity and location of the particles usually have *no bearing* on the circumstances during the incident. Specifically, finding gunshot residue does not necessarily mean that it was the sampled subject that pulled the trigger [and] the lack of gunshot residue does not exonerate a person." (See Exhibit "F"). Finally, Mr. Kilty will opine that there is no generally accepted standard in the relevant scientific community regarding the number of particles required to support a conclusion that the subject has recently fired a gun, or was in close proximity to a firearm that was discharged.

III. PROPOSED FINDINGS OF FACT:

1. Dover Police responded to the area of Capital Green Apartments to investigate an anonymous complaint of Mr. Pearsall's possession and firing of a handgun.
2. Shortly before arriving, police received additional anonymous information that Mr. Pearsall was sitting next to a woman to whom he had passed the gun.

3. Upon arriving at the scene, the police observed Mr. Pearsall and another male sitting together with an unknown woman. They observed a bulge in the woman's shorts and, immediately arrested her and Mr. Pearsall. A handgun was recovered from her shorts.

4. Mr. Pearsall is right handed, and was observed completing and signing police paperwork with his right hand.

5. Officer Kuntzi, who arrested both Mr. Pearsall and the woman, conducted a gunshot residue field test on Mr. Pearsall's right hand. According to Officer Kuntzi, this field was positive for the presence of nitrates.

6. Thereafter, Officer Kuntzi swabbed Mr. Pearsall's left and right hands for gunshot residue. The collected evidence (the swabs) were forwarded to the ATF for analysis.

7. Officer Kuntzi was not trained or certified in the procedures used to collect samples or test for gunshot residue.

8. A firearm that discharges a bullet produces unique spherical particles of three elements that are fused together as a result of the explosion: antimony, lead and barium. These particles unique to gunshot residue do not degrade or change, and are readily transferable from one surface to another.

9. The ATF, in turn, sent the swabs to RJ Lee for analysis. RJ Lee reported that the swab taken of Mr. Pearsall's left hand revealed only one particle unique to gunshot residue. (See Exhibit A, p. 4) No other indication of the presence of particles unique to gunshot residue were found or reported by RJ Lee.

10. In effectuating the arrest of Mr. Pearsall and the other two individuals with him on the night in question, the Dover Police Department failed to follow appropriate safeguards and protocols to insure the integrity of the evidence relative to the presence or lack of presence of gunshot residue on Mr. Pearsall's person.

11. Thus, there were numerous opportunities for cross-contamination of Mr. Pearsall and his hands from which the swabs were collected.

12. The low level of particles unique to gunshot residue (one particle in this case) taken from Mr. Pearsall's left hand may have resulted from Mr. Pearsall coming in contact with gunshot residue in a manner other than through discharging a firearm or being near a firearm that was discharged.

13. The presence of a particle unique to gunshot residue does not in anyway indicate that said residue came from, or is linked to, the weapon possession of which Mr. Pearsall is charged in the Indictment.

IV. PROPOSED CONCLUSIONS OF LAW:

1. As such, the recovery of the presence of a single particle associated with gunshot residue lacks any evidentiary value or relevance in a prosecution for felon in possession, 18 U.S.C. § 922(g). See Fed. R. Evid. 401, 402.

2. Moreover, the presence of a single particle generally associated with the gunshot residue is insufficient to actually establish the presence of gunshot residue. (See Exhibits D - G). See Fed. R. Evid. 702.

3. Consequently, the RJ Lee laboratory findings are neither probative or relevant to determine whether the defendant possessed the gun in question. See Fed. R. Evid. 401, 402, 702.

4. The Dover Police Department gathered no spent shell casings to determine if there could be any gunshot residue match with samples obtained from Mr. Pearsall.

5. There is no evidence linking gunshot residue in the 9mm Vector semiautomatic pistol to that obtained from the sampling of Mr. Pearsall.

6. The expert opinion of A.J. Schwoeble[2], the Director of RJ Lee Group, was found to not be admissible in State v. Jason Moua. (See Exhibit "G"). Schwoeble's testimony was not found to be reliable enough for a jury to consider it in Moua, where either one to three particles unique to gunshot residue was found on sampled areas; one particle was found on the defendant's right palm, three particles on the back of the left hand, and two particles on the left palm. The Moua court did not allow Schwoeble's proffered expert testimony to be admitted due to the fact that proper procedures for sampling of the defendant were not followed and because there is not an accepted standard regarding the number of particles necessary to support a positive conclusion. (See Exhibit "G", p. 23).

[2] A. J. Schwoeble's opinion in Moua was very similar to this action. In his report in Moua Schwoeble wrote that "(p)articles confirmed as unique to or characteristic of GSR could have resulted from the discharge of a firearm, or being in proximity to a firearm to a discharging firearm Handling of contaminated firearms and/or ammunition components can also contribute to the presence of particles unique to or characteristic of GSR." See Moua, p. 5-6

7. The amount of particles in this case are much less than in Moua, which demonstrates that the government's expert witnesses' proffered testimony in this action is not reliable enough to be admitted. See Fed. R. Evid. 702.

8. The government's expert witnesses' proffered testimony in this case merely speculates as to three possible explanations for the test results. Such speculation is not permissible. Moreover, these explanations as to the possible inferences to be drawn from the presence of gunshot residue will not aid the fact finder. See Fed. R. Evid. 401, 402, 702.

9. The government's expert witnesses' proffered testimony in this case is not based upon a sufficient review of the facts in this case and is not the product of reliable principles and methods that are applied in a reliable way to the Facts of the case. See Fed. R. Evid. 702.

10. The government's expert witnesses' proffered testimony in this case is inconsistent with the criteria of the FBI Laboratory when it was in operation, and other agencies which have set threshold levels for conclusions based upon particles unique to gunshot residue. See Fed. R. Evid. 702.

11. The probative value of the government's proffered expert witness testimonyis outweighed by the danger of unfair prejudice. See Fed. R. Evid. 403.

12. Consequently the Government's proffered expert testimony does not comport with the requirements of Daubert, and Fed. R. Evid. 702, and thus such testimony is not admissible.

V. MEMORANDUM OF LAW IN SUPPORT DEFENDANT'S PROPOSED FINDINGS OF FACT AND CONCLUSIONS OF LAW

A District Court has broad discretion to determine the admissibility of expert witness testimony and has "'considerable leeway' in determining the reliability of particular expert testimony under Daubert." Simmons v. Ford Motor Company, 2005 U.S. App. Lexis 9930 p.3. See also In re Pauli R.R. Yard PCB Litig., 35 F.3d 717 (1994). Here, the government's experts have speculated that there are three distinctly different possible sources for the single particle unique to gunshot residue found on Mr. Pearsall's hand. By dividing its ultimate opinion into three distinctly different categories, the government's experts have demonstrated that they cannot reasonably conclude as to the source of the one particle unique to gunshot residue that was found. Thus, the government's expert witnesses' testimony fails to meet the admissibility standard of Daubert and Fed. R. Evid. 702.[3] Such a triumvirate of opinions, each contradictory of one another, underlie that the expert witnesses' conclusion is not the product of reliable principals and methods.

This Court must hold that the government's expert has relied on insufficient evidence in finding that the single particle unique to gunshot residue found on Mr. Pearsall's hand could have originated from a gun that he had recently fired. While there is no generally accepted standard as to the threshold number of unique particles that must be present to support a finding that the subject recently fired a gun, numerous government agencies have set the threshold at a level of three or more

[3] Rule 702 of the Federal Rules of Evidence allows expert witness testimony if the expert's "scientific, technical, or other specialized knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue, a witness qualified as an expert by knowledge, skill, experience, training, or education, may testify thereto in the form of an opinion or otherwise, if (1) the testimony is based upon sufficient facts or data, (2) the testimony is the product of reliable principles and methods, and (3) the witness has applied the principles and methods reliably to the facts of the case."

unique particles. Also, proper evidence gathering techniques were not used by the Dover Police Department. Furthermore, there is no Third Circuit or United States Supreme Court case law to support any contention that the government's expert witnesses proffered testimony is based upon sufficient facts or is the product of the application of reliable principles and methodology. This dearth of case law demonstrates the need for this Court to make a meaningful inquiry into the basis of the government's proposed expert witness testimony.

Although the federal courts have not addressed the appropriate threshold level for gunshot residue evidence, in State v. Jason Moua, Court File No. K5-05-7335 (Anoka County Ct. July 7, 2006), the Anoka County Court for the Tenth Judicial District of Minnesota excluded the expert opinion testimony of a member of the RJ Lee Group concerning the results of a gunshot residue test. In Moua, the State sought to introduce evidence substantially similar to, although with slightly more weight than, the evidence proffered here. Specifically, the State offered an expert who planned to testify that according to the test results, between one and three particles unique to gunshot residue were found on Moua's hands, and further, that the presence of such particles could have resulted from either Moua's discharge of a firearm or his proximity to a discharging firearm.

After a lengthy Frye/Mack hearing,[4] the court excluded the proffered expert opinion evidence on two independent grounds. First, the Court based its decision on the lack of any generally accepted scientific standard in the community of gunshot residue testing as to the number of particles unique to gunshot residue necessary to support the conclusion that the subject has fired a gun, or was nearby

[4] Expert testimony in many state courts is admissible under a similar, but not identical standard called the Frye/Mack standard. There, the proponent of the evidence must demonstrate that (1) the scientific technique or theory is generally accepted in the relevant scientific community and (2) the particular evidence derived from that test must have a foundation that is scientifically reliable. See Moua at 14.

when another person fired a gun, or handled a gun. See Moua at 16, 23. The Moua court found "it is clear that significant questions exist in the relevant scientific community concerning how many particles are required for there to be a positive test." See Moua at 16. Furthermore, the Moua court also noted that, at most, "(t)he scientists agree a positive test will only conclude a person has been in the environment of gunshot residue." Id. In Moua as in the case at hand, law enforcement had failed to follow proper procedures for the sampling of gunshot residue. Id. Second, the Moua Court found that the proffered testimony of the RJ Lee Group's expert was not based upon reliable methodology so as to be admissible. Id. at 20. Lastly, the Moua court found that the prejudice from allowing the admission of the RJ Lee Group's expert testimony was outweighed by the probative value. Id. at 21-23. Thus, Moua provides clear guidance for this Court to preclude the admission of the government's proffered expert witness testimony in this case.

In conclusion, because of the lack of consensus in the relevant scientific community regarding the transferability of gunshot residue, there is simply "too great an analytical gap" between the single particle found on Mr. Pearsall's hand and the opinion that the Government's witnesses' plan to offer at trial. See General Electric Co. v. Joiner, 522 U.S. 136, 146 (1997) (finding that there may be "too great an analytical gap between the data and the opinion proffered" to allow the admission of expert opinion testimony). The Defense asserts that the government's expert witnesses' opinion is simply not the product of an application of reliable principles or methodology.

Finally, in addition to the fact that the government's evidence does not meet the standards of Rule 702 and Daubert, it is also properly excludable pursuant to Fed. R. Evid. 403. This Rule provides:

Although relevant, evidence may be excluded if its probative value is substantially

> outweighed by the danger of unfair prejudice, confusion of the issues, or misleading the jury, or by considerations of undue delay, waste of time, or needless presentation of cumulative evidence.

This Court should conclude that even if the government has met its burden under Daubert and Rule 702, the risk of undue prejudice and confusion is too great in this instance to allow the proposed expert witness testimony. When balancing all interests, the admission of the government expert's testimony, whose probative value is questionable because it offers three radically different, possible conclusions based on the evidence, creates a substantial danger of prejudice that outweighs its evidentiary value.

Moreover, the gunshot residue evidence here is not particularly linked to the seized weapon that gives rise to the instant charge against defendant. However, the gunshot residue evidence here would permit to jury to improperly infer that the defendant must have possessed, nonetheless, the weapon in question. Worse yet, such gunshot residue evidence may lead the jury to conclude that the defendant fired some gun at some time and, therefore, he must be guilty of the instant offense.

WHEREFORE, Mr. Pearsall respectfully requests that the Court schedule a pre-trial Daubert hearing to determine whether the government's proposed expert testimony will be admissible at trial, or the extent to which it would be admissible. Mr. Pearsall also requests an opportunity to present legal memoranda to supplement the factual record after an evidentiary hearing is held.

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Attorney for Kevin Pearsall

DATED: February 6, 2007

CERTIFICATE OF SERVICE

Undersigned counsel certifies that the attached filing of Defendant Pearsall is available for public viewing and downloading and was electronically delivered on February 6, 2007 to:

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EXHIBIT A

SEM ANALYSIS of GUNSHOT RESIDUE SAMPLES

ATF
ATF Case Number 761035 06 0114
Dover PD Number 50-06-020064

PEARSALL
BAER

RJ Lee Group Project Number FRH610162

November 2, 2006

RJ LeeGroup, Inc.

The Materials Characterization Specialists

SEM ANALYSIS of GUNSHOT RESIDUE SAMPLES

ATF
ATF Case Number 761035 06 1114
Dover PD Number 50-06-020064

PEARSALL
BAER

RJ Lee Group Project Number FRH610162

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November 2, 2006

INTRODUCTION

One Instant Shooter Identification-2 kit containing a total of three samples was received from Special Agent David DiBetta of the ATF for GSR analysis. The samples were identified as follows:

Client's Sample ID	RJ Lee Group Sample No.
ATF Case No. 761035 06 1114 Dover PD No. 50-06-020064	
Swab	1010117
Right Hand	1010118
Left Hand	1010119

SAMPLE PREPARATION

See attached instruction sheet from Law Enforcement Technologies.

SEM ANALYSIS

The samples were initially examined using manual microscopy to set run parameters and sample analysis area. They were then analyzed using an automated scanning electron microscope (PERSONAL SEM®) equipped with a full gunshot residue analysis package, including automated stage, backscattered electron (BSE) detector, energy dispersive x-ray spectrometer (EDS) and automated GSR analysis software.

When lead (Pb), antimony (Sb), and barium (Ba), combine or fuse into a single particle, it is defined as being unique to GSR, barring elemental tags from other sources. Any particles with a combination of two of these elements (Pb, Sb and Ba) with high-temperature features or morphology are classified as consistent with GSR. Particles confirmed as being unique to or consistent with GSR could have resulted from the discharge of a firearm, being in close proximity to a discharging firearm of from contact with a surface contaminated with GSR.

The SEM analysis, on a particle-by-particle basis, retains the individual feature characteristics and can relate the presence of lead (Pb), antimony (Sb) and barium (Ba) to a single particle. When the instrument detects particles with the presence of Pb, Sb and Ba, it flags the particles as potential GSR and stores images, composition and coordinate data for relocation and confirmation by manual microscopy after the automated analysis is completed. A summary run sheet is printed with stored images and spectral data for relocation and confirmation applications. Summary sheets and images of flagged potential GSR particles from the automated analyses are found in the appendix of this report. Flagged particles were relocated for compositional confirmation.

ANALYTICAL RESULTS

A list of confirmed particles detected during the analysis is as follows:

Sample ID	RJ Lee Group Sample No.	TIFF Image No.	Composition	Number of Particles	Figure No.
Swab	1010117		Total Unique Particles – 0 Total Consistent-With Particles – 0 Total Single Component Particles – 0		
Right Hand	1010118		Total Unique Particles – 0 Total Consistent-With Particles – 1 Total Single Component Particles – 6		
Left Hand	1010119	0119001	Pb-Sb-Ba	Unique to GSR	1
			Total Unique Particles – 1 Total Consistent-With Particles – 2 Total Single Component Particles – 8		

CONCLUSIONS

A particle confirmed as being unique to-and particles confirmed as being consistent-with GSR were found on Left Hand (RJ Lee Group sample number 1010119).

A particle confirmed as being consistent with GSR was found on Right Hand (RJ Lee Group sample number 1010118).

There were no GSR related particles found on Swab (RJ Lee Group sample number 1010117).

These results are submitted pursuant to RJ Lee Group's current terms and conditions of sale, including the company's standard warranty and limitation of liability provisions. No responsibility or liability is assumed for the manner in which the results are used or interpreted. The submitted items are being the Dover Police Department, attention Evidence Room.

A. J. Schwoeble, Director
Forensic Science Department

Elana Foster, Manager
Forensic Science Department

David M. Freehling
Associate Forensic Chemist
Forensic Science Department

AJS:mah

Law Enforcement Technologies, Inc.
770 Wooten Rd. Suite 109
Colorado Springs, CO., 80915

LAW ENFORCEMENT TECHNOLOGIES

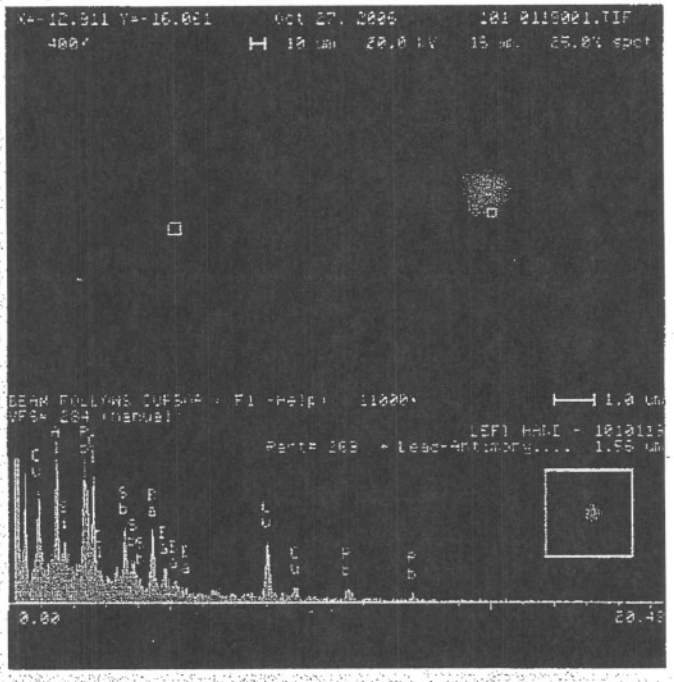
Procedure for retrieving GSR elements from LET ISID swab

1.) Place a 0.45 micron filter in a Buchner funnel
2.) Place the LET swab (face down) on a 0.45 micron filter (47 mm)
3.) Apply house vacuum to the Buchner funnel
4.) Slowly drop dilute solution of sodium bicarbonate on the swab until the foaming ceases. The vacuum will assist in transferring any residue that is dislodged by the foaming action from the LET swab to the 0.45 micron filter paper.
5.) Gently rinse the swab(s) with de-ionized (DI) water using a wash bottle until it tests neutral with pH paper.
6.) Transfer the 0.45-micron filter paper to a vacuum desiccator and allow to dry.
7.) Analyze via SEM

The first 5 steps should take about 5 minutes.

Ph. 719-380-5557
Fax 719-380-9075
www.lawenforcetech.co

ATF
Case No. 761035 06 1114 • RJ Lee Group Project No. FRH610162



Pb-Ba-Sb Particle • TIFF Image No. 0119001

Figure 1. Backscattered electron image and elemental spectrum of particle detected on Left Hand (RJ Lee Group Sample No. 1010119).

APPENDIX

Summary Sheets and Images of Flagged Potential GSR Particles Detected During the Automated Analysis

(The sample number is located on the fourth line from the top of each summary and follows the word *Descript:*)

DMF
EAF

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PSEM GSR Analysis V2.03 PSEM 400

Started 10/30/6 at 16:59 Total Analysis Time 0:58:40

Subject: SWAB Lab: RJLG
Descrip: 1010117 ISID KIT Operator: AJS/EAF/DMF
Client: ATF RPF: GSR22.RPF
Ref#: FRH610162 RuleFile: GSR10.ZRR
FileID: 000170_C VEC File: GSR10.VEC
DEN File: METAL.DEN

Accel. Voltage: 20.0 kV
Working Distance: 16 mm

Mag	Part	Range (um)	StrtFlds	CmplFlds	Area (mm^2)
500	34	0.25 - 177.80	2225	2225.00	70.339

Particle Count by Rule (alph order). Total Particles: 34

* Antimony.....	0	Titanium.....	0
* Ba-Sb.....	0	Tungsten.....	3
* Barium.....	0	Zinc.....	0
* Lead Rich.....	1	Zircon.....	0
* Lead-Antimony....	0	**UNCLASSIFIED**...	0
* Lead-Barium.....	0		
* Unique Pb-Ba-Sb..	0		
Aluminum.....	0		
Barium Sulfate.....	0		
Bismuth.....	0		
Brass.....	0		
Chromium.....	11		
Copper-Nickel.....	0		
Copper.....	0		
Engine Exhaust.....	0		
Gold.....	5		
Iron Rich.....	6		
Iron-Titanium.....	0		
Lead-Titanium.....	0		
Lighter Flint.....	0		
Manganese.....	0		
Mercury Bearing....	0		
Misc Metal.....	0		
Misc. Silicates....	1		
Misc. salts.....	0		
Misc. sulfur.....	0		
Nickel.....	0		
Other.....	0		
Pyrite.....	0		
Silver.....	0		
Solder.....	0		
Stainless Steel....	7		
Strontium-bearing..	0		
Tin.....	0		

Run Status: Complete (Full user-defined area has been analyzed)

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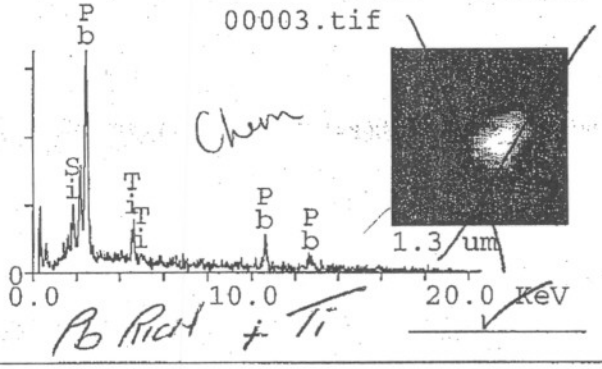
FRH610162

PSEM 400 PSEM GSR V2.02
SWAB - 1010117 ISID KIT (000170_C)



Chem

Pb Rich + Ti

EAF

****

PSEM GSR Analysis V2.03 PSEM 400

Started 10/27/6 at 02:33 Total Analysis Time 1:30:32

Subject: RIGHT HAND Lab: RJLG
Descrip: 1010118 Operator: AJS/EAF/DMF
Client: ATF RPF: GSR22.RPF
Ref#: FRH610162 RuleFile: GSR10.ZRR
FileID: 000167_H VEC File: GSR10.VEC
DEN File: METAL.DEN

Accel. Voltage: 20.0 kV
Working Distance: 16 mm

Mag	Part	Range (um)	StrtFlds	CmplFlds	Area (mm^2)
500	1217	0.25 - 177.80	1825	1825.00	57.693

Particle Count by Rule (alph order) Total Particles: 1217

* Antimony	4	Titanium	0
* Ba-Sb	0	Tungsten	1
* Barium	5	Zinc	16
* Lead Rich	0	Zircon	3
* Lead-Antimony	0	**UNCLASSIFIED**	0
* Lead-Barium	0		
* Unique Pb-Ba-Sb	0		
Aluminum	1		
Barium Sulfate	33		
Bismuth	2		
Brass	17		
Chromium	0		
Copper-Nickel	2		
Copper	11		
Engine Exhaust	0		
Gold	32		
Iron Rich	929		
Iron-Titanium	4		
Lead-Titanium	0		
Lighter Flint	25		
Manganese	0		
Mercury Bearing	0		
Misc Metal	1		
Misc. Silicates	9		
Misc. salts	20		
Misc. sulfur	2		
Nickel	58		
Other	10		
Pyrite	3		
Silver	4		
Solder	0		
Stainless Steel	25		
Strontium-bearing	0		
Tin	0		

Run Status: Complete (Full user-defined area has been analyzed)

****

FRH610160

PSEM 400 PSEM GSR V2.02
RIGHT HAND - 1010118 (000167_H)

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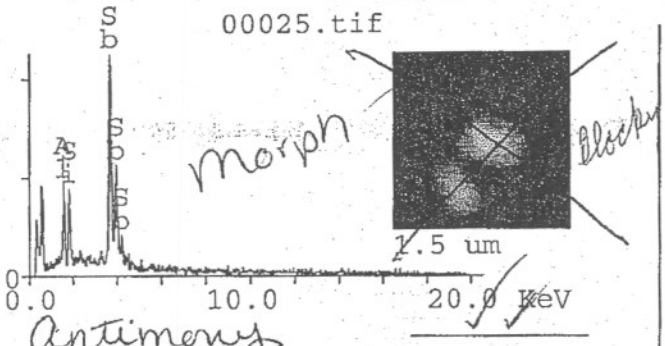

morph

Antimony

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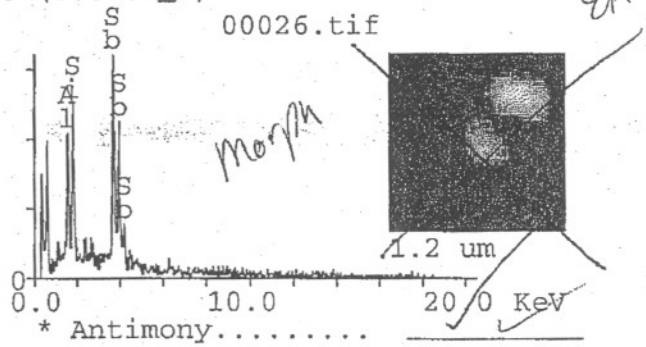

morph

EAF

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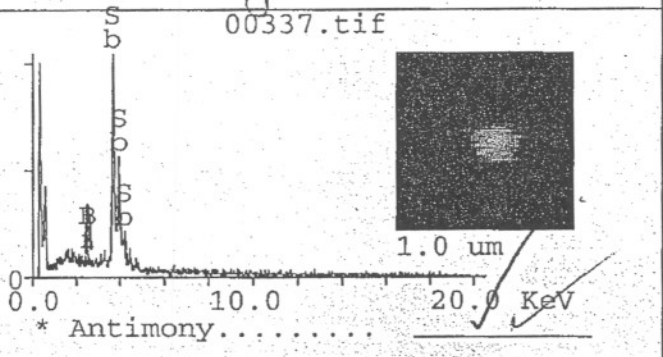

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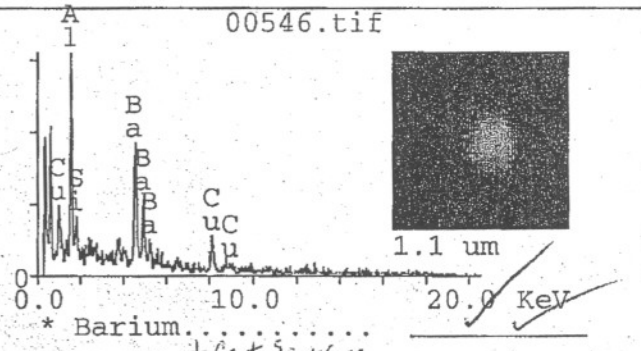

+ Co + Si + Sr

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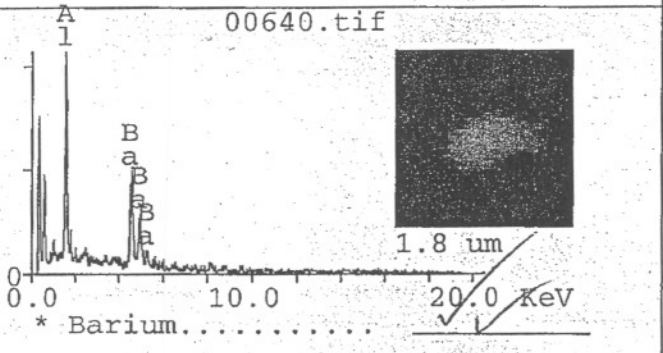

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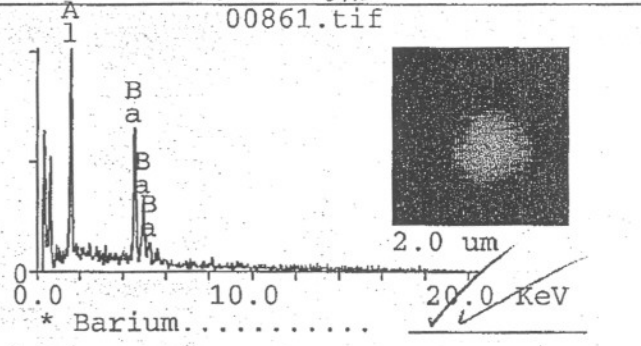

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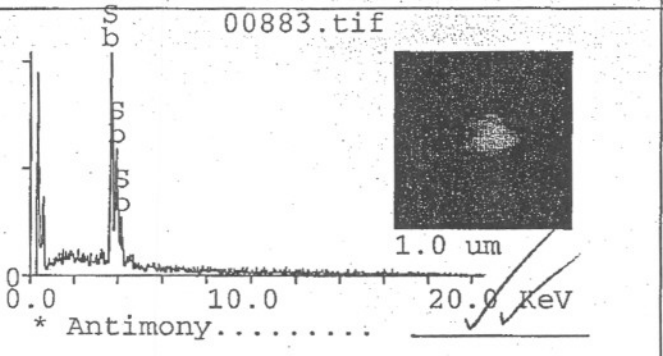

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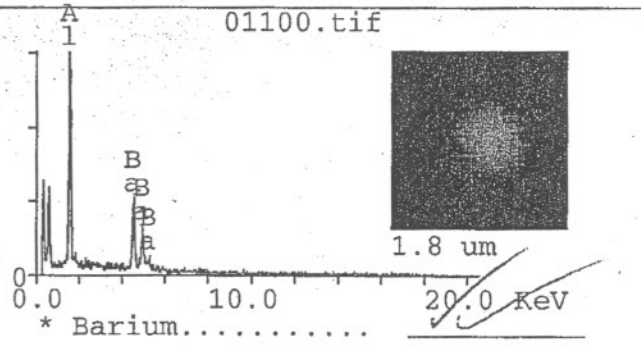

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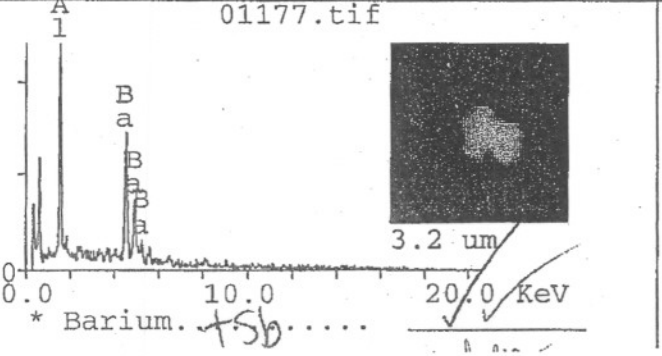

+ Sb

****

PSEM GSR Analysis V2.03 PSEM 400

Started 10/27/6 at 04:04 Total Analysis Time 1:36:17

Subject: LEFT HAND Lab: RJLG
Descrip: 1010119 Operator: AJS/EAF/DMF
Client: ATF RPF: GSR22.RPF
Ref#: FRH610162 RuleFile: GSR10.ZRR
FileID: 000167_I VEC File: GSR10.VEC
DEN File: METAL.DEN

Accel. Voltage: 20.0 kV
Working Distance: 16 mm

Mag	Part	Range (um)	StrtFlds	CmplFlds	Area (mm^2)
500	1011	0.25 - 177.80	2225	2225.00	70.339

Particle Count by Rule (alph order) Total Particles: 1011

* Antimony.....	2	Titanium.....	1
* Ba-Sb.....	0	Tungsten.....	1
* Barium.....	12	Zinc.....	9
* Lead Rich.....	0	Zircon.....	5
* Lead-Antimony....	1	**UNCLASSIFIED**...	0
* Lead-Barium.....	1		
* Unique Pb-Ba-Sb..	0		
Aluminum.....	3		
Barium Sulfate.....	59		
Bismuth.....	4		
Brass.....	25		
Chromium.....	1		
Copper-Nickel.....	2		
Copper.....	11		
Engine Exhaust.....	0		
Gold.....	21		
Iron Rich.....	615		
Iron-Titanium.....	9		
Lead-Titanium.....	0		
Lighter Flint.....	39		
Manganese.....	0		
Mercury Bearing....	2		
Misc Metal.....	1		
Misc. Silicates....	5		
Misc. salts.....	35		
Misc. sulfur.....	6		
Nickel.....	84		
Other.....	6		
Pyrite.....	4		
Silver.....	9		
Solder.....	0		
Stainless Steel....	31		
Strontium-bearing..	5		
Tin.....	2		

Run Status: Complete (Full user-defined area has been analyzed)
****

FRH610162

PSEM 400 PSEM GSR V2.02
LEFT HAND - 1010119 (000167_I)

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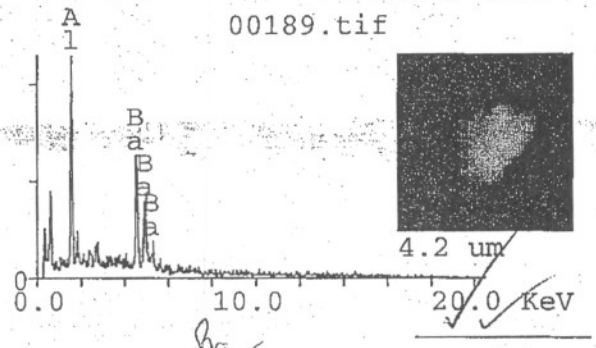

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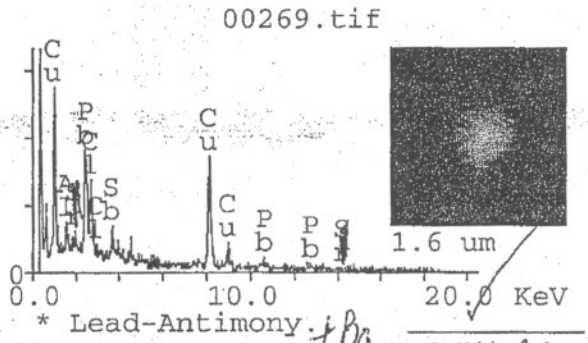

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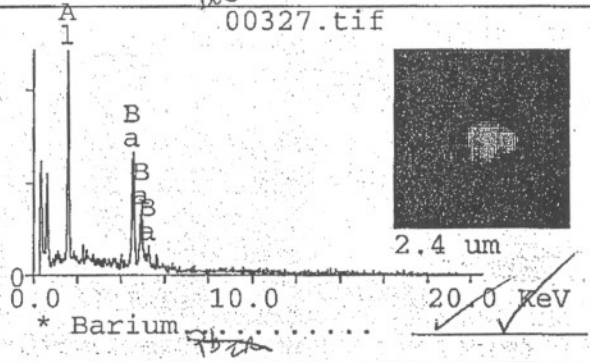

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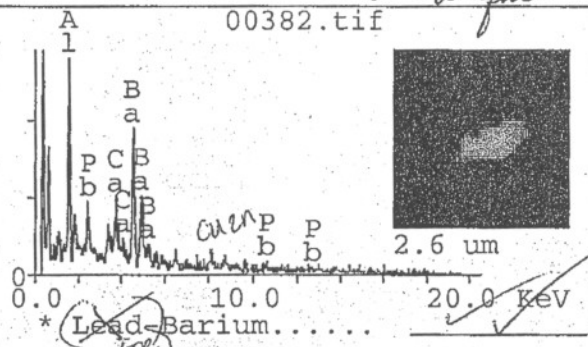

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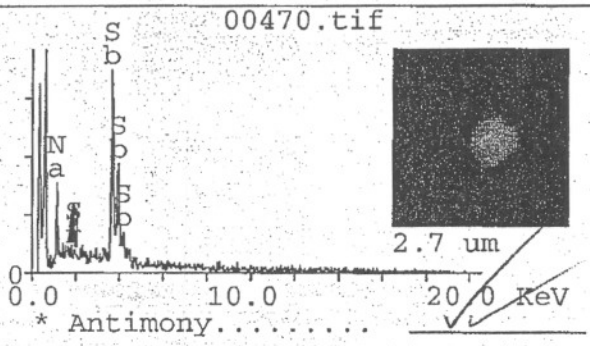

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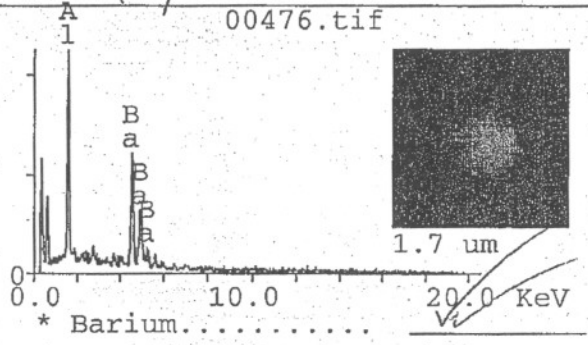

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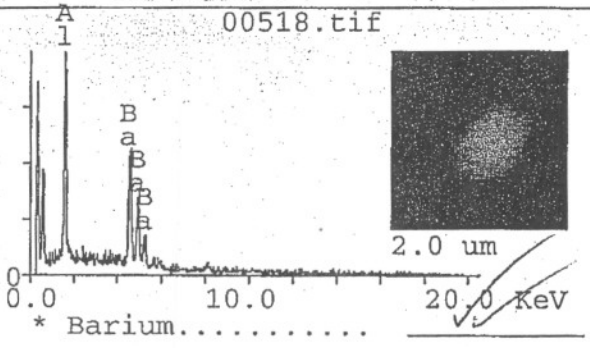

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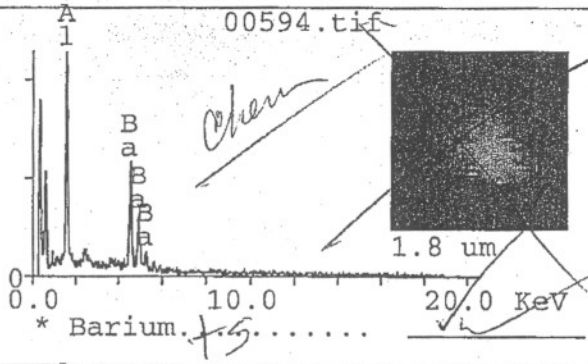

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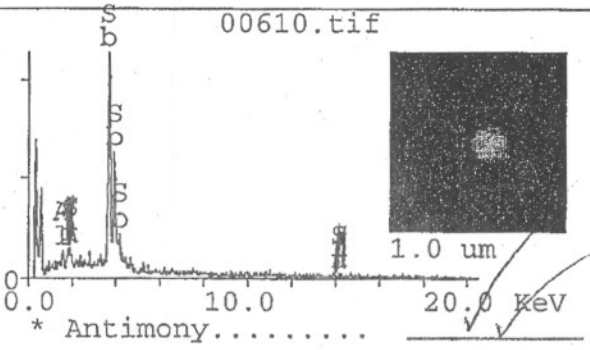

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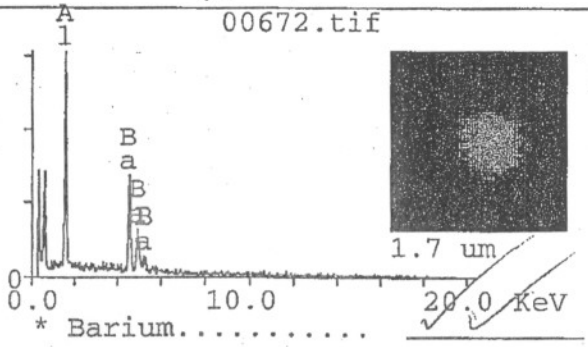

FRH6010162

PSEM 400 PSEM GSR V2.02
LEFT HAND - 1010119 (000167_I)

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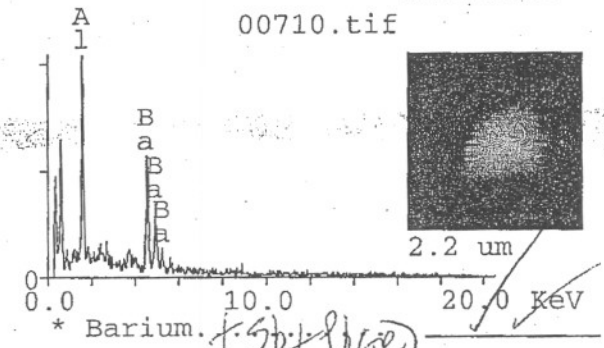

* Barium. +Sb+Pb(?)

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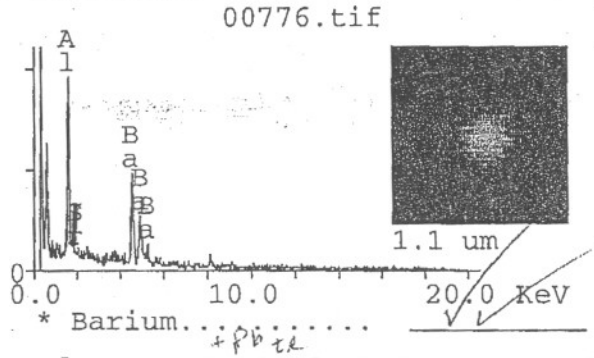

* Barium. +Pb tr

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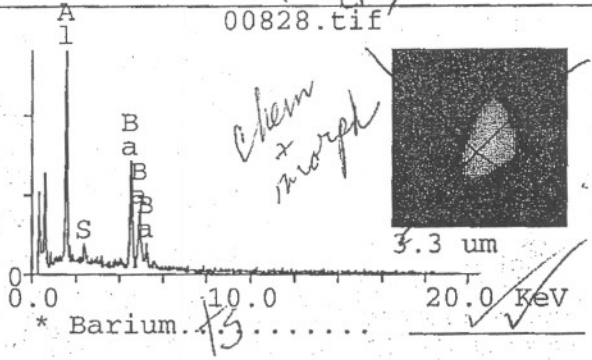

chem + morph

* Barium. +S

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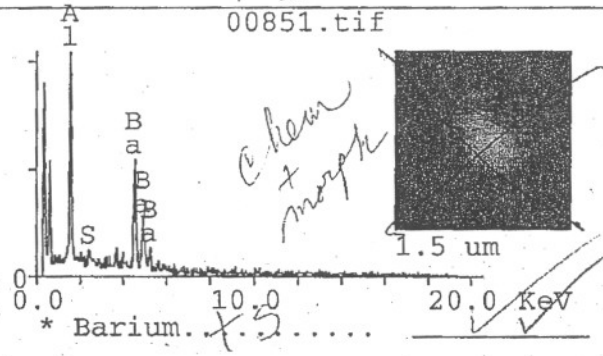

chem + morph

* Barium. +S

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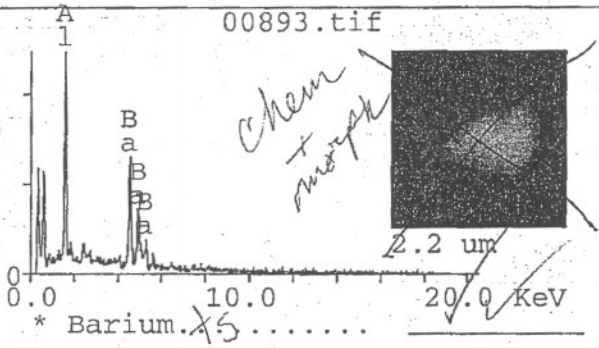

chem + morph

* Barium. +S

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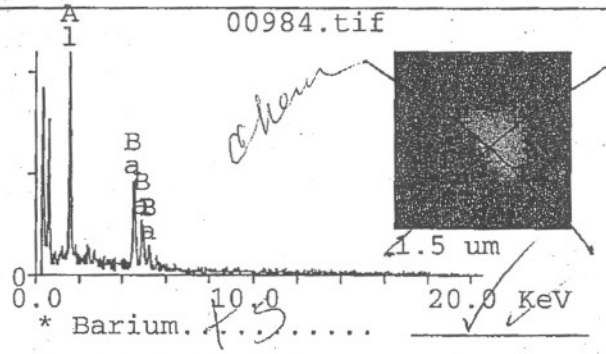

chem

* Barium. +S

RJ Lee*Group*, Inc.

www.rjlg.com

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350 Hochberg Road
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Phone (724) 325-1776
FAX (724) 733-1799

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Manassas, VA 20109
Phone (703) 368-7880
FAX (703) 368-7761

Bay Area Laboratory
530 McCormick Street
San Leandro, CA 94577
Phone (510) 567-0480
FAX (510) 567-0488

EXHIBIT B

EXHIBIT B

U.S. Department of Justice

United States Attorney's Office
District of Delaware

Nemours Building
1007 Orange Street, Suite 7100
P.O. Box 2046
Wilmington, Delaware 19899-2046

(302) 573-6277
FAX (302) 573-6220

January 25, 2007

Telefax and
Hand Delivered

Christopher Koyste, Esquire
Federal Public Defender's Office
First Federal Plaza, Suite 110
704 King Street
Wilmington, Delaware 19801

Re: **United States v. Kevin L. Pearsall**
Criminal Action No. 06-118-JJF

Dear Mr. Koyste:

Previously I provided you a copy of the November 2, 2006, report of R.J. Lee Group, Inc. (the report). Also I provided you with color copies of a representative "Binary" Gunshot Residue GSR Test Kit.

Enclosed please find the CV's for the three signatories to the report. They each conducted an examination and any one of the three can testify to the results of the report. At this time I am uncertain as to who will testify. Also enclosed are the lab's photocopies of the packages mailed to the lab by SA DeBetta, ATF; internal chain of custody log, two pages of the lob book designating when the tests were run; run set up notes; and analysis sheets. The enclosures have a fax page number the top right hand corner. The enclosures run from page 2 - 29.

The lab report of November 2, 2006, constitutes a summary of the witnesses' testimony. The witnesses' ultimate conclusion is that the defendant could have discharges a firearm, but in close proximity to a discharging firearm, or had contact with a surface contaminated with GSR.

Please contact me if you have any questions.

Very truly yours,

COLM F. CONNOLLY
United States Attorney

By: _____
Edmond Falgowski
Assistant United States Attorney

EF:slb
Enclosures

EXHIBIT C

John W. Kilty
13102 Jingle Lane
Silver Spring, MD 20906
Telephone 301-946-4338
Facsimile 301-933-9280

Forensic Science Consultant

Practice limited to consultations, evaluations and expert testimony in areas of gunshot primer residue, compositional analysis of metals and the applications of neutron activation analysis, scanning electron microscopy with X-ray analysis, atomic absorption spectrophotometry and inductively-coupled plasma spectrometry to the analysis of physical evidence.

WORK EXPERIENCE

1987 to Present	Forensic Science Consultant
1975 to 1987	Chief, Gunshot Residue and Metals Analysis Unit, FBI Laboratory, Washington, DC
1965 to 1975	Supervisory Special Agent, FBI Laboratory
1963 to 1965	Special Agent, Baltimore Field Office, FBI

PUBLICATIONS

Kilty, J. W., "A Review of the FBI Laboratory's Gunshot Primer Residue Program." Crime Laboratory Digest 13, no. 2 (1986): 55-61.

____, and V. R. Matricardi, "Detection of Gunshot Residue Particles from the Hands of a Shooter." Journal of Forensic Sciences 22, no. 4 (1977): 725-738.

____, "Activity After Shooting and Its Effect on the Retention of Primer Residue." Journal of Forensic Sciences 20, no. 2 (1975): 219-230.

OTHER

Lectured or made presentations at Kent State University, University of California (Irvine), Miami University, the American Chemical Society, the California Association of Criminalists, the Northeastern Association of Forensic Scientists, the Association of Firearm and Toolmark Examiners, the American Academy of Forensic Sciences, the Association of Official Analytical Chemists and other professional associations.

EDUCATION

Bachelor of Science (Chemistry)
Graduate Studies (two years, no graduate degree)

EXHIBIT D

FORENSIC SCIENCE COMMUNICATIONS

Forensic Science Communications July 2006 – Volume 8 – Number 3
Research and Technology

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Current Issue

Summary of the FBI Laboratory's Gunshot Residue Symposium, May 31–June 3, 2005

Diana M. Wright
Forensic Examiner
Chemistry Unit
FBI Laboratory
Quantico, Virginia

Michael A. Trimpe
Forensic Scientist
Hamilton County Coroner's Office
Cincinnati, Ohio

Abstract | Introduction | GSR Defined | Composition and Morphology | Hand Sampling and Contamination | Case-Acceptance Criteria | Testing Victims and Suspected Suicides | Testing Clothing | Instant Shooter Identification Kits | Significance and Report Writing | Technical Review | Proficiency Testing | Methodology | ASTM Guidelines | Conclusion | Editor's Note | Acknowledgment | References | Appendix

Abstract

In response to the need for formalized gunshot residue (GSR) discussions, the FBI Laboratory hosted a four-day symposium in the spring of 2005 to address a wide range of issues. Attendees included GSR examiners and researchers from international, federal, state, and local government agencies as well as private laboratories. The topics that were discussed and the general guidelines that were approved by the group are presented in detail. Some issues were too broad for the time allotted or will require more study before consensus can be reached. Several participants made plans to pursue some of these areas in greater detail, with studies designed around suggestions initiated at the symposium. There was agreement that the GSR community is in need of a document that can provide general guidelines with respect to the policy for accepting cases, the criteria necessary for reporting a positive GSR result, and the importance of both elemental composition and morphology in defining the presence of GSR.

Introduction

In early 2005 approximately 40 scientists representing local, state, federal, international, and private laboratories were invited to attend an FBI-sponsored symposium dedicated to topics relevant to the detection and significance of GSR analyses. This event was held in Quantico, Virginia, from May 31 through June 3, 2005. The mission of the symposium was to attempt to establish guidelines for the acceptance, practices, and interpretation of GSR examinations conducted primarily by scanning electron microscopy with energy dispersive X-ray spectrometry detection (SEM/EDS). Although the goals were ambitious, they were not unrealistic, given that the attendees were selected based primarily on their experience level and firsthand knowledge of key analytical aspects of the discipline. Many of the symposium participants had previously conducted research in selected areas that proved to be quite beneficial to the group. These scientists shared their published and unpublished research with the group in order to facilitate

discussions.

From the early planning stages, the format of the symposium was modeled after a scientific working group (SWG), in which experts in the relevant area of discussion could present work that would form the basis for discussion and eventual guidelines in that discipline. In order to provide a starting platform for these discussions, several topics of primary interest were sent to the attendees for review. These topics were determined from discussions on a listserv dedicated to forensic applications of SEM, as well as from discussions within the general GSR/SEM community. Participants were encouraged to rank the listed topics by importance and to add subjects that might be more specific to the individuals or their agencies. This list formed the basis for the order of the topics and the time allotted to each. Participants were also surveyed regarding their level of expertise; instrumentation; sample reports for positive, inconclusive, and negative findings; and information pertaining to any legal challenges they may have encountered in this discipline.

In order to encourage participation among the attendees, a consensus-building format was established. Based on the ranked listings received during the planning of the symposium, the moderator would open a topic for discussion with a general statement such as, "A conclusion regarding a positive GSR result should be based on both morphology and elemental composition." If the statement required clarification, some discussion might ensue at that time. Once the statement was in a form that was acceptable to most participants, a vote was taken. The choices offered for a question such as described were usually "Agree," "Disagree," or "Need to discuss further." The vote was conducted using a keypad system in which all votes were recorded electronically and anonymously. The tally was then projected onto a screen so that all attendees could quickly determine if consensus had been reached. If a majority was reached, the minority voters were allowed to comment further on their vote or let the vote stand as it was decided. If the vote was split, further discussion could be held to determine if the discrepancy resulted from a poorly worded statement or a lack of agreement as to the concept itself. Topics that were too broad or deemed in need of additional study were set aside to allow for maximization of the time allotted.

As a result of cumulative discussions, participants agreed upon some general concepts, which will be shared in this paper. The discussions that took place will provide a basis for more uniform agreement as to how GSR evidence is accepted, analyzed, and interpreted. The symposium participants agreed that more work is needed to establish criteria in several key areas. However, progress was achieved in some areas, and those discussions will be described here.

GSR Defined

The first two topics were considered to be of primary importance because they relate to the fundamentals of the examination. Participants were asked if they could reach consensus as to the source of the residue studied and the nomenclature used to describe it. There was agreement that GSR originates in part from the firearm, the cartridge case, and the bullet, with most of the inorganic residue resulting from the primer. Most experts agreed that despite the combination of potential sources that could contribute to the formation of detectable residues, the best term to describe these particles is *gunshot residue,* or *GSR*, as opposed to such terms as *primer residue* or *cartridge discharge residue*.

When asked about terminology to describe the significance of GSR particles, most experts said they prefer to describe the classic three-component PbBaSb spheroid particle only as being *characteristic of* gunshot residue

rather than *unique to* GSR. Only 4 out of 39 voting participants would choose to retain the use of the word *unique* for such particles. (The majority who chose to abstain from the *unique* classification cited work by Torre et al. from 2002 that reported a rounded, molten non-GSR particle that contained PbBaSb.) However, most attendees agreed that when a population of particles is taken into consideration, this type of three-component particle can be described as having come from a discharged firearm. Particles containing only two of the three components are currently described as *commonly associated with GSR*, *characteristic of GSR*, *consistent with GSR*, and/or *indicative of GSR*.

Additionally, the majority of attending experts stated that when two-component particles are identified in the absence of three-component particles, they would indicate the presence of these particles in some form in their laboratory reports. Most of the experts also agreed that BaSb particles no longer can be given the same weight as PbBaSb particles because of the former's reported presence in some types of used brake pads. However, a majority of respondents also indicated that it is possible to differentiate between brake pad particles and gunshot residue particles. All agreed with this statement when taking into consideration the entire population, morphology, and elemental distribution in the particles. Studies also have been conducted that find that similar conclusions can be reached regarding fireworks (Mosher et al. 1998; Trimpe 2001).

Composition and Morphology

Almost all participants indicated that particle morphology, elemental composition, and, if necessary, a comparison of any known residue (from ammunition involved in the case) should be considered when categorizing particles as GSR. All participants indicated that a noncrystalline (nonsymmetrical) particle containing PbBaSb might be characterized as a GSR particle. In conjunction with the elemental profile, a majority indicated that the physical form of a GSR particle should show evidence of rapid solidification in the form of a spheroid or other shapes variously described as *noncrystalline*, *condensed*, *rounded*, *fused together*, or *irregular*. Sizes also would be expected to vary. There was no definitive consensus reached as to what term would most likely be used to describe the morphology of particles in residue from a discharged firearm. However, the terms *spheroid*, *condensed*, and *rounded* to describe particle shape were the most popular from a list that also included *noncrystalline*, *irregular*, *molten*, and *none of the above*.

To illustrate the importance of both morphology and elemental composition in consideration of potential GSR particles, case studies of brake pads were provided. Karl Lueftl and colleagues in Germany tested brake pads from BMW vehicles and observed a small number of GSR-like particles (with molten-looking shape), which lacked barium (Lueftl and Gebhart 2004). A. J. "Skip" Schwoeble provided data from 20 Volkswagen brake discs, from which he observed that all potential GSR particles also contained Mg-Si-Fe constituents, thereby disallowing a conclusion of positive firearm-related residues (Schwoeble 2005). John Giacalone's study of brake pads supported this work in concluding that GSR-like particles could be produced from brake pads, but the exclusion based on nonallowed elements and the morphology specifically associated with GSR make it possible to distinguish between brake dust and firearm GSR (Giacalone 2000).

In a limited study conducted by the Texas Department of Public Safety, 11 brake pads from automobiles in the laboratory's parking lot were sampled. A total of four SbBa particles were found on the 11 sampling stubs. Of those four particles, one was composed primarily of zirconium, one had a crystalline morphology, and the remaining two were noncrystalline, nonspheroidal entities (White 2005). In another study to determine how often

a three-component GSR-like particle is found in brake dust, the Virginia Department of Forensic Science completed a preliminary evaluation in 2004. Brake dust samples were collected from 66 vehicles, including 8 Volkswagens and 2 Audis. More than 134,000 brake dust particles were analyzed; 851 were classified as two-component particles during the automated SEM/EDS analysis. The majority of those particles were potentially barium sulfate. An occasional two-component BaSb particle with high levels of iron was also detected. However, no three-component (PbBaSb) particles were detected (DeGaetano, Maye, and Harrison 2005).

A paper titled "Further Studies to Discriminate Primer Discharge Residues from Particles of Environmental Origin" presented at the 2005 SCANNING conference was also mentioned in the discussion (Garafano et al. 2005). In this work, X-ray mapping revealed that the PbBaSb distribution did not indicate a fusion of the elements, but rather showed them to be only in proximity as nonhomogeneous aggregates that appeared in dense fields of particles (i.e., not separated far enough to prevent fluorescent excitation of elements in nearby particles). Samples were obtained from 15 cars (11 models of Volkswagen, Audi, Opel, and BMW manufacture) and 3 motorcycles manufactured by Ducati. More than 100 particles were examined with compositions similar to GSR (i.e., PbBaSb, BaSb, PbSb, or PbBa). Results revealed that each of these particles was found with Pb > Sb or Ba as reported by Torre et al. in 2002 and Cardinetti in 2004. Fe, Cu, Zn, and Si, all "allowable" elements in GSR residues, were also present in the spectra. The authors also noted that particles of fused PbSb, which cannot be distinguished from GSR species, were observed.

Hand Sampling and Contamination

All participants agreed that GSR sampling should be done at the scene, where permissible, and as expeditiously as possible. With respect to sampling and transfer concerns, it was unanimously agreed that it would be best to sample a subject's hands before bagging the hands or placing the subject in a police vehicle. It was also agreed that armed law enforcement officers can transfer GSR particles to a subject through contact. Almost all participants agreed that if the subject's hands cannot be sampled before placing the subject in a police vehicle, the subject's hands should be bagged in order to prevent possible contamination. Another recommendation was that, to the extent possible, all used cartridge cases and/or firearms be kept away from the GSR sampling kits, the area where sampling will take place, and the area of the laboratory where GSR analyses are performed.

The majority further agreed that it is possible for a handcuffed person's hands to be contaminated by the prior presence of GSR in the backseat of a police vehicle. However, if asked in court how likely it is for a handcuffed person's hands to be contaminated in the backseat of a police vehicle, most GSR experts would answer, "I don't know." Faye Springer offered data from a study of the backseats of law enforcement patrol vehicles in which 40 GSR samples were collected from 20 Sacramento Police Department patrol units as the vehicles were returning from the officers' shifts. None of the sampled backseats contained PbBaSb or PbBa particles. However, 6 vehicles tested positive for lead particles, and 2 contained one PbSb particle each (Springer 2005).

The Colorado Bureau of Investigation's study of the backseats of 26 law enforcement patrol vehicles indicated that at least 1 three-component particle was found in 14 of the vehicles. Five of the remaining 12 vehicles had at least 1 two-component particle detected. Only 7 vehicles had no PbBaSb particles detected (Rugh and Crowe 2005).

Debra Kowal also provided data from a three-part study that attempted to

determine the occurrence of GSR in the law enforcement environment (Kowal 2005). In the first part of the study, vehicles from half of the Los Angeles County Sheriff's substations were sampled for GSR in the backseat "cupping area," a well or cutout in the lower portion of the seat where restrained individuals can rest their hands during transport. Two-component particles were detected on 45 of the 50 analyzed samples. Four of the 45 samples also contained three-component PbBaSb particles. Only 5 of the 50 samples were negative for the presence of GSR particles.

Kowal conducted a second study with respect to the secondary transfer of particles from the backseat of a patrol vehicle to a restrained individual's hands. A handcuffed person known to have GSR on the hands was placed in the backseat of a patrol vehicle for approximately 10 minutes, followed by a restrained individual known to have hands free of GSR. Sampling of the second person's hands indicated that 12 three-component and 10 two-component particles were transferred from the seat to the second individual's previously GSR-free hands.

The third part of the study described the transfer that took place when an individual with "clean" hands was handcuffed by an on-duty officer and placed in the backseat of a patrol vehicle for 10 minutes. Of the 41 samples collected from the hands of the previously "GSR-free" individuals, 20 had an average of 5 two-component particles transferred from the law enforcement environment (on-duty officer and/or patrol vehicle), 17 had no GSR-like particle transfer, and 4 contained PbBaSb particles. In 3 of those 4 cases, the officers had qualified with their service weapons during their shifts. The fourth transfer was noted on an individual who was handcuffed by an officer who had last drawn his firearm in the preceding 30 days.

In summary, the authors of the Kowal study demonstrated in the first part that GSR is in the environment of patrol car backseats. In part two, they demonstrated that transfer of GSR between a vehicle backseat and an individual is possible. And in part three, results indicated that GSR can be transferred from a law enforcement environment to an individual's hands. However, there are not sufficient data to statistically calculate a rate of transfer.

Geoffrey Warman noted that contamination might be identified through observation of the collective particle types and distribution observed in the examined residue. His laboratory noted the presence of a new particle type associated with pyrotechnic residues that was found on armed law enforcement officers. These particles contained Ba, Zr, Cr, Mn, with W also occasionally observed, and were concluded to result from the use of flash-bang distraction grenades. Warman concluded that these particles, if found on the subject, give independent evidence of transfer occurring from armed officers (Warman 2005).

Michael Martinez reported on a study of 100 handcuffed subjects who were sampled for the presence of GSR while in the custody of local law enforcement officers. Sampling took place after transport to magistrate court or jail while the subjects were awaiting arraignment. Two-component particles (either PbBa or PbSb) were located on 16 percent of the subjects on their dominant, unwashed hands. None of the subjects in this study had three-component particles on their hands. The authors concluded that the particles were transferred from a law enforcement officer, an inanimate object, or the back of the law enforcement vehicle in which the subjects had been transported (Martinez and Garcia 2005).

Another symposium participant offered information, which had been shared previously on the Forensic SEM listserv, describing a contamination study of different types of law enforcement vehicles, as well as table surfaces and

restraining bars in interrogation rooms. No three-component (PbBaSb) particles were found in most of the sampled vehicles, although two PbBaSb particles were detected in vehicles with cloth seats. Table surfaces revealed a much higher rate of transferred PbBaSb particles, reinforcing the need for sample collection prior to leaving the scene. Thus, although the study determined that there is a chance of secondary transfer to subjects from transporting or detaining them, it was relatively low based on the collected data. That observation was corroborated by the majority of the symposium participants.

Further discussion ensued as to how to resolve the issue of contamination from contact between law enforcement personnel and subjects. Michael McVicar provided preliminary data from a study conducted in Ontario that was used to determine the prevalence of GSR on nonshooting police officers. Sixteen volunteers for the study were sampled for GSR on the backs of their left and right hands, the palms of their shooting hands, the shirt sleeves on the side where they carried their service firearms, the handles of their batons, and their handcuffs. Slightly less than half of the officers had no three-component PbBaSb particles on the surfaces tested. Four of the tested officers were plainclothes detectives who tested positive for two-component BaSb and three-component PbBaSb particles. A questionnaire the officers filled out for the study did not indicate any activity that would account for the presence of GSR (Randall and McVicar 2000).

Thus, although unlikely in practice, it was suggested by a large majority of participants that in order to better distinguish between GSR from contact with law enforcement versus a civilian shooting event, a policy such as that set forth in some European Union countries (e.g., Germany) should be set, which mandates that all domestic law enforcement use ammunition with taggants detectable by SEM/EDS (Niewoehner et al. 2005). This approach seems reasonable on a scientific level because most experts further agreed that they do not know of alternative methods to distinguish residue produced by police ammunition.

It was widely agreed that the average person who is not exposed to firearms or ammunition or its components will not be found to have GSR particles on the hands. Michael Martinez conducted an occupational study on 102 random individuals from 74 different occupations. The individuals were residents from the community who had been called for jury duty. Only one person was found to have a two-component particle on his hands. This juror reported that he had cleaned his hunting rifle 12 hours prior to being tested (Martinez 2005). These results indicate that a subject's daily environment can affect the likelihood of finding GSR. James Garcia of the U.S. Army Crime Laboratory reported that because the laboratory provides services in conjunction with investigations of military personnel, it expects to receive specimens with a higher propensity for elevated background levels of GSR. Therefore, the Army Crime Laboratory requires a threshold of at least four PbBaSb particles to report a positive GSR result for these specimens. The threshold was instituted to allow for the possibility of casual contact by subjects with firearms in the performance of their duties. However, levels beyond this value would likely involve greater exposure to GSR particles, namely, the recent discharge of a firearm (Garcia 2005). The FBI Laboratory has established a threshold for the number of GSR particles that is confirmed before an item can be concluded to have been exposed to gunshot residue. The number of particles used to confirm a GSR population is a minimum of three PbBaSb particles. Additionally, other particles consistent with a GSR-type environment also must be present: namely, SbBa, BaPb, PbSb, and/or other elements or element composites routinely found in GSR particle populations.

The majority of symposium participants overwhelmingly agreed that particles can transfer from one surface to another and that bystanders (e.g., a person

present at the time of the shooting who does not come into direct physical contact with the shooter, firearm, or any other surface potentially contaminated with GSR) can test positive for GSR. Michael McVicar also shared the results of a study that sought to determine whether a bystander could be reasonably distinguished from a shooter. The conclusion was that the high degree of variability that exists in the deposition of GSR as a result of the ammunition-firearm combination and the number of shots fired produces an overlap between the GSR concentrations obtained from sampling either a shooter or bystander as quickly as 15 minutes postfiring. Therefore, the number of particles cannot be used as a basis for determining if someone fired, or was merely in the vicinity of, a recently discharged firearm (Lindsay and McVicar 2004).

Symposium participants also discussed that given the ease of transfer of GSR between surfaces, routine monitoring of the work environment should be included in a laboratory's standard protocol for GSR testing. At least 31 of the participants currently perform some form of routine testing in their laboratories to determine whether contamination is present.

Michael Martinez described an ongoing study his laboratory is conducting in an attempt to identify any GSR-positive "hot zones" within laboratory space. The results to date have led to a policy that no GSR examiner may enter the GSR instrument room on a day in which prior contact has transpired with any area of the firearms section of the laboratory (Martinez 2005). Michael McVicar stated that the policy of his laboratory restricts access such that no person who has handled a firearm or ammunition component, sampled an item for GSR, or entered the firearms section of the laboratory may enter the SEM laboratory for the remainder of that workday. Ludwig Niewoehner mentioned work that has been presented regarding the use of a clean room to cut down on the number of contamination-control samples that need to be run to ensure a GSR-free environment (Niewoehner and Neimke 1999). Wayne Niemeyer presented similar work regarding contamination studies and the use of a clean room (Niemeyer 2005).

Case-Acceptance Criteria

Before discussing acceptance criteria, the participants agreed that the most probative value of GSR examination occurs in cases where the subject claims to have not handled or fired a firearm. The great majority of participants agreed that there is no value in collecting separate samples from the back and palm surfaces of the hand because it is more misleading than informative. Furthermore, the analyst should have the discretion to prioritize the samples submitted and discontinue the analysis when GSR is found. The participants also agreed unanimously that it is appropriate for a laboratory to have acceptance criteria or to limit the number of items examined.

Symposium participants also discussed time limits between a shooting incident and the collection of GSR on live subjects. Many participants stated that an acceptable cutoff time is 4 to 6 hours after the shooting event, whereas some felt that up to 8 hours was appropriate. Still others were comfortable accepting lifts taken more than 12 hours after the shooting. The Virginia Department of Forensic Science recommends sample collection within 4 to 6 hours of the shooting event as long as the hands have not been washed. Geoffrey Warman from England's Forensic Science Service commented that subjects could recontaminate their hands up to the time of arrest and that there was no probative value in examining samples taken more than 4 to 6 hours after arrest. He further noted that findings in relation to samples taken many hours after a shooting are better attributed to a more recent event or the redistribution of particles from some other contaminated surface (Warman 2005). For its acceptance policy, the FBI Laboratory uses a cutoff of 5 hours. The Florida Department of Law Enforcement and the Centre of Forensic Sciences in Toronto, Ontario, Canada, both have a stated

time limit not to exceed 8 hours (Radcliffe 2005; McVicar 2005). All of the attendees stated that they recommend that samples be collected from the hands as quickly as possible and that laboratories may elect not to analyze lifts from the hands of live subjects 4 to 12 hours after the event in question.

Some of the attending laboratories also have policies in place to exclude analysis of samples collected from victims of gunshot wounds or anyone known to have handled a firearm. Many laboratories accept samples from only the hands, as opposed to other areas of the body, such as the face. This policy is supported by data presented by Douglas DeGaetano from Virginia. In an 18-month study conducted between 1993 and 1994, he reported that of 286 face samples analyzed, GSR was found on the face in only 9 cases in which the hand samples were negative (DeGaetano 2005). Only one-quarter of the participants at the symposium receive GSR lifts collected from the face of a subject. An overwhelming majority of the participants would consider analyzing face samples but agreed they should be examined only if hand samples are negative or unavailable.

When asked if it is satisfactory to use a single stub for sampling both hands and face together as long as tackiness remains, the majority disagreed. One of the concerns cited was the potential for high numbers of cosmetic particles—including bismuth, titanium, and iron-based pigments—on the facial area. These particles can hinder the search for GSR. Keeping the face and hand samples separate alleviates concerns about masking GSR particles on the hands with contaminants from the face. When asked if it is satisfactory to use one stub for sampling both hands together as long as tackiness remains, two-thirds agreed. However, one participant voiced the opinion that sometimes circumstances dictate the use of multiple stubs and that valuable information could be lost if those samples are not collected.

The types of kits that the participating laboratories will accept vary. Some participants stated that they accept "two lifter" kits, some accept "four lifter" kits, and the majority stated that they will accept any type of SEM/EDS GSR kit they receive. It was suggested that when in doubt, if the laboratory did not supply the kits to the contributor, it is wise for the contributor to phone the laboratory prior to sample collection for clarification about acceptable kits.

Under the subject of acceptance criteria, the participants were asked if they perform quality assurance (QA) testing on their supplier's GSR kits before using them in the field. Less than half test the kits themselves, and most are satisfied with the supplier's QA testing assurances.

About half of the participants require that the information sheet with the kits have certain mandatory information filled out before they will accept the kit. Many have no such requirements, and only a few require that the sheet be filled out completely.

Testing Victims and Suspected Suicides

When asked if GSR testing should be done on suspected suicide victims, almost all participants agreed that these samples should be collected; however, they should be analyzed only if probative value can be shown.

The overwhelming majority of the experts agreed with the following statements:

1. Analyzing lifter samples for GSR from victims can never prove whether the subject is a victim of a suicide, a homicide, or an accident.

2. Particles are expected to be found on a victim shot at close range or within a reasonable distance from the muzzle, up to several feet.

3. Depending on the circumstances, some victims near the shooting may not have GSR particles on them.

In these discussions, Douglas DeGaetano reported that in a 10-year study of 5,231 GSR-related cases in Virginia, 39 percent (2,040 cases) involved possible suicides. Of this number, roughly 13 percent of suicide victims did not test positive for GSR particles. GSR collected from the hands of suicide victims at the scene was positive 92 percent of the time, whereas GSR collected from the hands of suicide victims at the morgue was positive 76 percent of the time (DeGaetano and Harrison 2004).

Michael Trimpe conducted a two-year study at the Hamilton County Coroner's Office (Ohio) during which 80 victims of suspected suicide were sampled for the presence of GSR. Seventy-nine percent of the victims tested positive for either two- or three-component classic GSR particles. Some of the reasons hypothesized for a negative result on 21 percent of the victims tested included medical attention received prior to sampling, bagging of the hands, time delay between the shooting and sampling and subsequent transport of the body, weather conditions, weapon type, number of shots fired, and refrigeration of the body prior to sampling for GSR. In the last scenario, condensation on the skin could remove GSR particles prior to sampling, much as hand washing or heavy perspiration might (Trimpe 1997).

A similar study was conducted by Michael Martinez in Bexar County, Texas, on 126 suspected suicide victims involving at least five different calibers of weapon. Only 48 of the individuals sampled tested positive for GSR. Of this number, 10 percent had only one GSR particle present. Possible reasons for the results included large amounts of blood on the surfaces sampled, a new or cleaned firearm used in the shooting event, an incorrect cause of death reported by medical examiners, and improper sample collection. It was concluded that if further testing was desired, the weapon and ammunition should be submitted (Martinez and Garcia 2005).

Finally, Carol Crowe reported that the Colorado Bureau of Investigation keeps a database to track the rate of positively confirmed GSR on victims of fatal gunshot wounds. Current information revealed that the bureau has classified GSR on 80 percent of homicide victims (94 out of 118 people with at least one PbBaSb particle found) versus a rate of 94 percent for victims of suicide (156 out of 166 people confirmed to have at least one PbBaSb particle on the area sampled) (Crowe 2005).

Discussions confirmed that the presence of GSR cannot determine whether the victim's death was the result of a homicide or a suicide; moreover, some suicide victims can test negative for the presence of GSR depending upon the circumstances and environmental conditions imposed postmortem on the body prior to sampling.

Testing Clothing

Discussions were also held regarding testing clothing for the presence of gunshot residues. Attendees who have performed research or casework in this area provided details for reference. The sampling technique and materials were described as analogous to hand sampling in an article that originally appeared in the *IAMA Newsletter* (International Association for Microanalysis) (Martinez 2000).

Guidelines for sample submission and acceptance were offered by Michael McVicar (McVicar 2005). These parameters included collecting the sample

at the laboratory by trained personnel who have not discharged or been in the vicinity of a discharged weapon within the past 24 hours prior to sample collection. If personnel seizing the clothing have discharged a weapon, at a minimum, they should thoroughly wash their hands, change their clothes, and don gloves prior to evidence collection. With respect to packaging the clothing, paper (bags or wrapping), rather than plastic, is recommended. Additionally, larger garments should be folded with brown paper between the folds in order to prevent the transfer of GSR from one area to another. If the latter step is not taken, it is recommended that the analyst photograph the clothing in its packaging as received to demonstrate why a conclusion cannot be reached as to where the particles originated on the garment. A. J. Schwoeble of the RJ Lee Group in Pennsylvania suggested the use of white "butcher-type" waxed paper as an alternative to the traditional brown kraft paper in order to prevent the introduction of fibers from the paper onto the garment (Schwoeble 2005).

With respect to case acceptance of clothing items, Michael McVicar advised that the Centre of Forensic Sciences also instructs its contributors to ensure that the garment being submitted can reasonably be expected to have had direct contact with or proximity to a discharged firearm. Within this context, a shirt worn inside another layer would not be as probative for sampling purposes as the outer garment. Other items such as shoes would similarly be considered too far removed from the discharge to have received appreciable amounts of residue. Finally, items with a surface relatively free of loose debris or easily shed fibers are preferable.

Carol Crowe provided a study performed by the Colorado Bureau of Investigation in which clothing was tested for GSR residues subsequent to discharging a weapon and laundering the worn garments in a conventional washing machine with warm water and detergent (Chavez et al. 2001). A variety of garments and fabrics were tested both postfiring and postlaundering. Results demonstrated the persistence of three-component GSR particles and/or two-component (supporting) particles on some of the garments even after washing. However, as the authors stated in their conclusions, the presence of GSR on clothing cannot provide confirmation of a recent association with a discharged firearm in the same manner that such findings on a living person's skin (i.e., hands or face) might suggest. In other words, time of GSR deposition on clothing cannot be assessed in the same context as when it is confirmed on specimens taken directly from skin surfaces.

Several participants offered evidence that persistence on fibrous materials is longer than on skin. In particular, a study by A. J. Schwoeble found that the number of PbBaSb particles discovered after clothing was laundered was reduced between 88 and 99 percent. Thus, whereas most PbBaSb particles were found to be in the 1–10-µm size range before washing, only particles less than 2 µm were found afterward.

Other suggestions provided for the analysis of clothing included:

1. Sampling the clothing while it is still worn by the subject rather than packaging it for transport to the laboratory.
2. Carbon-coating all stubs used to sample fibrous material to reduce or prevent charging effects.
3. Dedicating the SEM chamber to only one case when fibrous samples are being analyzed, in the event of particle transfer from charging effects.
4. Using adhesive lifters, which are better suited to GSR examinations of clothing surfaces than vacuuming all matter embedded in the fabric

weave, when attempting to locate GSR particles from a recent firing.

5. Sampling areas on the garment where a weapon could be concealed (e.g., pocket interiors).

In conclusion, the participants unanimously agreed that there are circumstances when items of clothing associated with a subject and event should be examined for the presence of GSR (e.g., when hand samples are negative or not available).

"Instant Shooter" Identification Kits

With respect to combination kits, such as field-use "instant shooter kits" (marketed as ISID, RIFF, or other brands), GSR lifts for SEM should always be taken before the instant shooter swabbing is employed. Unequivocally, taping (using adhesive lifts), as opposed to swabbing, for GSR by SEM is the best form of sampling. The marketed instant shooter kits are essentially an updated version of the dermal nitrate test that uses a color change to detect the presence of nitrates.

Historically, the dermal nitrate test has been shown to produce many false positives and is not specific for the presence of GSR. The use of the presumptive kits now being marketed may cause the loss of GSR particles. Of the kits marketed for rapid detection of nitrates (presumably from nitrocellulose in smokeless powder), extraction procedures are cumbersome, time-consuming, and much less successful at recovering GSR particles than adhesive lifts. This finding was reported by Faye Springer in a recent journal article (Hanson and Springer 2005) and has been independently corroborated at the FBI Laboratory. As a result of discussions among attendees from several laboratories that have observed similar problems, the majority of the group members did not think these kits should be used to collect or test for GSR in place of SEM/EDS analysis, and most were not willing to analyze them for this purpose. Moreover, although there was no strenuous objection to independent laboratories' performing further tests on instant shooter kits for GSR particle retention, some participants advised against it for the reasons stated above.

Significance and Report Writing

With respect to the significance of the results obtained, most experts felt that even one PbBaSb spheroid particle is enough for a "positive" result. However, almost all of the attending experts agreed that GSR particles alone cannot be attributed to a particular shooting event. It also cannot be determined what actually occurred with respect to a shooter's hands between the time of shooting and sampling. It is understood that GSR particles cannot be used to distinguish between shooters and bystanders. Similarly, the absence of gunshot residues on a sample does not preclude the possibility of that individual's having discharged a firearm. Many of the experts also stated that these caveats are included in some form in reporting out inconclusive or negative results.

Along the lines of interpretation, some experts stated that they list particle counts to report everything found in a search for GSR, whereas others felt that this approach might be misleading to those who are unable to interpret results. More than half of the respondents indicated that the use of particle counts needed to be followed by an opinion statement to provide context to the findings.

A majority of the attendees reiterated throughout these discussions that a qualifying statement is needed in reports. The following example is

considered an appropriate qualifying statement to use when particles are found on a person's hands: the findings are "consistent with that person's having fired a weapon, having been in the vicinity of a fired weapon, or having touched an item with gunshot residue on it." For negative results, GSR may not have been detected for reasons that may include:

1. Lack of exposure of the individual to GSR.
2. Removal of particles through physical activity, hand washing, or weather conditions.
3. Lack of traditional GSR components in the ammunition (e.g., organic primer formulations or primers lacking one of the three components associated with GSR).
4. Heavy soil deposition on the surface being sampled.
5. Improper use of the collection kit (e.g., rubbing the sampling surface with the stub rather than dabbing might cause damage to the tape surface).
6. Lack of deposition of an acceptable threshold of GSR particles by the discharged firearm.

Depending on the request, other qualifiers might also be used to convey limitations. Examples include the inability of GSR examinations to determine firing angles, the handedness of the shooter, the hand used to discharge the weapon, and the type of weapon used.

Many of the responding attendees agreed that it is good practice to compare residue found on the suspect to the shooting event through examination of the firearm, spent ammunition from the scene, or the victims' clothing; however, it is not essential to do so. Similarly, slightly more than half agreed that the firearm should be test-fired, when available and applicable in a GSR case, to determine if residues are deposited. It is generally acknowledged that residues released from ammunition during discharge are not all generated from that shooting event (Schwoeble and Exline 2000). Rather, the residue population may also include contributions from ammunitions previously fired from that gun. Therefore, the direct comparison of residue populations from the victim, suspect, and test firings must be interpreted with caution.

Technical Review

The majority of attendees indicated that their laboratories require that *all* GSR reports be peer-reviewed (i.e., technically reviewed) prior to being released and that they support this policy. The majority agreed that, at a minimum, the American Society of Crime Laboratory Directors/Laboratory Accreditation Board (ASCLD/LAB), or some other relevant accrediting body, should set a policy as to what percentage of all reports should be peer-reviewed (technically reviewed) by another qualified examiner prior to release.

Some symposium participants work for laboratory systems that do not have a policy for any technical review prior to issuing a report. However, most of the attendees agreed that an administrative review alone is not sufficient to ensure technical accuracy. Further discussion elucidated the idea that the time spent in review is helpful to both the reporting examiner and the reviewer with respect to sharing ideas and minimizing testifying to a report with inaccuracies ranging from typographical errors to technical mistakes.

Proficiency Testing

With respect to quality-assurance-related topics, the symposium participants all agreed that the European Network of Forensic Science Institutes' (ENFSI) GSR proficiency test should be adopted as an approved test for GSR analysis by SEM/EDS (Niewoehner et al. 2005). This standard sample, prepared by the PLANO Company in Germany in accordance with ISO (International Organization for Standardization) 5725 for the performance of proficiency tests, consists of "synthetic GSR particles" with the composition of PbBaSb precipitated onto a silicon substrate previously coated with a carbon layer. Although it is not a good representation of a real-world GSR sample, it is the best proficiency-testing sample currently available for GSR. It can also be used for system validation.

Most experts also agreed that they would be willing to participate in a round-robin proficiency test in the absence of a standardized commercial GSR testing program. Roughly half of the respondents agreed that they would even participate in a round-robin to the extent that they would accept responsibility for preparing and distributing the test on a rotating basis.

The majority also agreed that examiners who perform GSR analysis should be proficiency-tested specifically in GSR regardless of whether they have already been tested on other materials characterized as "trace" samples.

Finally, the majority of participants agreed that they look for submicron particles in their automated search routines, and therefore, neither a specific test for proficiency nor an instrument vendor should dictate what range of particle sizes should be characterized or studied in an analysis.

Methodology

The symposium attendees stated that, in general, they conduct GSR analyses using SEM/EDS. Although the vast majority confirmed that they perform these examinations using automated search routines, the group unanimously agreed that manual confirmation should always be performed for at least a representative sample of the population. It was stated unequivocally that automated search routines alone cannot be used reliably to report a positive GSR result.

With the development of test methods that identify multiple components of smokeless powder and its additives rather than only nitrate residues, the group supported participation in research and development in this area. Particular mention was made regarding research into organic residues. New technology recently acquired by two laboratories whose personnel attended the symposium may hold promise in this regard. The instrument of interest is a time-of-flight mass spectrometer capable of real-time, nondestructive analysis of a wide range of materials commonly encountered in forensics. It is expected that research into its applicability to non-lead- based GSR residues will be forthcoming in the literature.

Further discussion and research was also advocated in the area of primers that produce nonclassical GSR residues, such as BaSbAl or TiZn or other non-lead-containing components. Time constraints limited the scope of this topic, and as a result, no definitive statements were offered for consensus voting. However, the area remains one of interest within the community and does warrant future attention.

ASTM Guidelines

A representative from ASTM International was present at the symposium to provide the attendees with an update as to the progress made to date on the ASTM guide *E1588-95(2001) Standard Guide for Gunshot Residue Analysis by Scanning Electron Microscopy/Energy-Dispersive Spectroscopy*. The group was given an overview of the status of the revision of the guide and encouraged to discuss any problems with the current ASTM guideline. Comments and suggestions were noted for later discussion within the committee.

Conclusion

At the conclusion of the symposium, several topics remained open for further discussion: namely, the use of time limits in case-acceptance criteria and how to standardize the language used to report the presence of GSR particles. Topics such as these are often dictated by individual laboratory policies, as well as the circumstances of a particular case. Therefore, it is unlikely that universal guidelines and terminology will evolve for the GSR community in these areas.

Some important topics were not discussed because of time limitations, specifically, airborne particles and elemental contributions from different ammunitions. However, the limitations of GSR examinations were unanimously recognized, such that the use of qualifying statements in report writing and testimony was discussed in detail. It is expected that the language of qualifiers will continue to develop in order to provide juries with a sound basis to evaluate the conclusions reached through GSR analyses. Research is also continuing in the areas of retention and contamination or transfer. It is hoped that these studies will be more readily available to the GSR community in the future through the use of Internet listservs and forums such as this one.

Editor's Note

The FBI recently decided to stop conducting GSR examinations. This decision was made after an internal assessment of the number of requests received for this examination in recent years and the probative nature of those requests.

The FBI Laboratory continues to believe that the GSR examination is valuable but has decided to use the resources previously dedicated to GSR in areas directly related to fighting terrorism, which is the FBI's primary mission.

The FBI Laboratory stands behind the reports it has already issued using this technique. Should a future case require GSR analysis, the Laboratory will send to the requesting agency a list of state, local, and private laboratories that conduct GSR examinations.

Acknowledgment

This is publication number 06-03 of the Laboratory Division of the Federal Bureau of Investigation. Names of commercial manufacturers are provided for identification purposes only, and inclusion does not imply endorsement by the FBI.

References

Cardinetti, B. *X-Ray Mapping Technique: Gunshot Residue Particles vs. Aggregates from Environmental Origin*. Presented at SCANNING,

Washington, D.C., 2004.

Chavez, D., Crowe, C., and Franco, L. The retention of gunshot residue on clothing after laundering. *IAMA Newsletter* (2001) 2(1):2–7.

Crowe, C. Colorado Bureau of Investigation, personal communication at the FBI Laboratory GSR Symposium, May 31–June 3, 2005.

DeGaetano, D. H. Virginia Department of Forensic Science, personal communication at the FBI Laboratory GSR Symposium, May 31–June 3, 2005.

DeGaetano, D. H. and Harrison, L. G. *GSR by SEM/EDX at the Commonwealth of Virginia—Ten Years of Data from Spreadsheet to Database.* Presented at SCANNING, Washington, D.C., 2004.

DeGaetano, D. H., Maye, S., and Harrison, L. G. Virginia Department of Forensic Science, personal communication at the FBI Laboratory GSR Symposium, May 31–June 3, 2005.

Garafano, L., Fratini, P., Minardi, M., Bizzaro, G. P., Tortora, F., and Manna, L. *Further Studies to Discriminate Primer Discharge Residues from Particles of Environmental Origin.* Presented at SCANNING, Monterrey, California, 2005.

Garcia J. D. U.S. Army Crime Laboratory, personal communication at the FBI Laboratory GSR Symposium, May 31–June 3, 2005.

Giacalone, J. *Putting the Brakes on Gunshot Residue*. Presented at SCANNING, San Antonio, Texas, 2000.

Hanson, A. M. and Springer, F. A. An evaluation of Instant Shooter Identification (ISid™) gunshot residue kits, *AFTE Journal* (2005) 37:172–178.

Kowal, D. *Gunshot Residue in the Law Enforcement Environment.* Presented at the California Association of Criminalists meeting, Glendale, California, 2000.

Lueftl, K. and Gebhart, E. *GSR-Like Particles from Brake Pads*. Presented at the BKA GSR Symposium, Bad Camberg, Germany, 2004.

Lindsay, E. and McVicar, M. J. *Passive Exposure and Persistence of Gunshot Residue on Bystanders to a Shooting: Can a Bystander Be Differentiated from a Shooter Based on GSR?* Presented at the joint meeting of the Canadian Society of Forensic Science and the Southern Association of Forensic Science, Mid-Atlantic Association of Forensic Science, and Midwestern Association of Forensic Science, Orlando, Florida, 2004.

Martinez , M. V. Bexar County Criminal Investigation Laboratory, personal communication at the FBI Laboratory GSR Symposium, May 31–June 3, 2005.

Martinez , M. V. P-GSR detection on clothing and in automobiles, *IAMA Newsletter* (2000) 1(2):2–3.

Martinez , M. V. Bexar County Criminal Investigation Laboratory, and Garcia J. D. U.S. Army Crime Laboratory, personal communication at the FBI

Laboratory GSR Symposium, May 31–June 3, 2005.

McVicar, M. J. Centre of Forensic Sciences, Toronto, Ontario, Canada, personal communication at the FBI Laboratory GSR Symposium, May 31–June 3, 2005.

Mosher, P. V., McVicar M. J., Randall E. D., and Sild, E. H. Gunshot residue-similar particles produced by fireworks, *Canadian Society of Forensic Science Journal* (1998) 31(2):157–168.

Niemeyer, W. D. McCrone Associates, Inc., Westmont, Illinois, personal communication at the FBI Laboratory GSR Symposium, May 31–June 3, 2005.

Niewoehner, L., Andrasko, J., Biegstraaten, J., Gunaratnam, L., Steffen, S., and Uhlig, S. Maintenance of the ENFSI proficiency test program on identification of GSR by SEM/EDX (GSR2003), *Journal of Forensic Sciences* (2005) 50:877–882.

Niewoehner, L. and Neimke, D. *Establishing a Cleanroom for GSR Investigation—A Necessity or Not?* Presented at the ENFSI EWG meeting, Den Haag, The Netherlands, 1999.

Radcliffe, D. T. Florida Department of Law Enforcement, personal communication at the FBI Laboratory GSR Symposium, May 31–June 3, 2005.

Randall, D. and McVicar, M. J. *A Study to Determine the Prevalence of GSR on Non-Shooting Police Officers*. Preliminary results presented at the 47th Canadian Society of Forensic Science meeting, Ottawa, Ontario, Canada, November 2000.

Rugh, A. and Crowe, C. *The Prevalence of Gunshot Residue in Law Enforcement Patrol Cars*. Presented at SCANNING, Monterey, California, 2005.

Schwoeble, A. J. *GSR Persistence on Clothing*. Presented (poster form) at the 51st American Academy of Forensic Sciences meeting, Orlando, Florida, 1999. Also presented (oral format) at the 26th Mid-Atlantic Association of Forensic Scientists meeting, Ocean City, Maryland, April 21–23, 1999.

Schwoeble, A. J. RJ Lee Group, Monroeville, Pennsylvania, personal communication at the FBI Laboratory GSR Symposium, May 31–June 3, 2005.

Schwoeble, A. J. and Exline D. L. *Current Methods in Forensic Gunshot Residue Analysis*. CRC Press, Boca Raton, Florida, 2000, pp. 92–123.

Springer, F. A. Sacramento County Office of the District Attorney Laboratory of Forensic Services, personal communication at the FBI Laboratory GSR Symposium, May 31–June 3, 2005.

Torre, C., Mattutino, G., Vasino, V., and Robino, C. Brake linings: A source of non-GSR particles containing lead, barium, and antimony, *Journal of Forensic Sciences* (2002) 47:494–504.

Trimpe, M. A. *A Review of Gunshot Residue Test Results in 80 Suicide Cases*. Presented at the American Academy of Forensic Sciences meeting, New York, 1997.

Trimpe, M. A. *Analysis of Fireworks for Particles of the Type Found in Primer Residue (GSR)*. Presented at the American Academy of Forensic Sciences meeting, Seattle, Washington, 2001.

Warman, G. Forensic Science Service, London, England, personal communication at the FBI Laboratory GSR Symposium, May 31–June 3, 2005.

White, T. R. Texas Department of Public Safety Crime Laboratory Service, personal communication at the FBI Laboratory GSR Symposium, May 31–June 3, 2005.

Appendix

The following scientists participated in the 2005 FBI Laboratory GSR Symposium:

Robert Berk, Illinois State Police, Chicago, Illinois

JoAnn Buscaglia, FBI Laboratory, Quantico, Virginia

James Crippin, Western Forensic Law Enforcement Training Center, Pueblo, Colorado

Carol M. Crowe, Colorado Bureau of Investigation, Lakewood, Colorado

Douglas H. DeGaetano, Commonwealth of Virginia, Department of Forensic Science, Richmond, Virginia

John E. Drugan, Massachusetts State Police Crime Laboratory, Sudbury, Massachusetts

Patricia C. Eddings, Tarrant County Medical Examiner's District Crime Laboratory, Fort Worth, Texas

Gamal Emira, Philadelphia Police Department Forensic Science Center, Philadelphia, Pennsylvania

James D. Garcia, U.S. Army Criminal Investigation Laboratory, Forest Park, Georgia

John R. Giacalone, State of Alaska, Department of Public Safety, Anchorage, Alaska

Lawrence Gunaratnam, National Bureau of Investigation Crime Laboratory, Vantaa, Finland

Joseph Harant, Baltimore City Police Department Laboratory, Baltimore, Maryland

Annalivia Harris, Montana State Crime Laboratory, Missoula, Montana

Robert L. Hinkley, Alameda County Sheriff's Office Criminalistics Laboratory, San Leandro, California

James L. Jackson Jr., Harris County Medical Examiner's Office, Houston, Texas

Robert D. Koons, FBI Laboratory, Quantico, Virginia

Debra Kowal, Los Angeles County Department of Coroner, Los Angeles, California

Thomas A. Kubic, TAKA, Inc., Northport, New York

Jozef Lebiedzik, Advanced Research Instruments Corporation, Golden, Colorado

Karl Lueftl, Bayerisches Landeskriminalamt (Bavarian State Criminal Police Agency), Munich, Germany

Michael Martinez, Bexar County Criminal Investigation Laboratory, San Antonio, Texas

Deborah Messina, Connecticut State Forensic Science Laboratory, Meriden, Connecticut

Michael J. McVicar, Centre of Forensic Sciences, Toronto, Ontario, Canada

Wayne D. Niemeyer, McCrone Associates, Inc., Westmont, Illinois

Ludwig Niewöhner, Bundeskriminalamt (BKA, Federal Criminal Police Office), Wiesbaden, Germany

Laila (Benham) Parahinia, Santa Clara County District Attorney's Crime Laboratory, San Jose, California

Elizabeth Patel, North Carolina State Bureau of Investigation, Raleigh, North Carolina

Michael Platek, Rhode Island State Crime Laboratory, Kingston, Rhode Island

Koren Powers, West Virginia State Police Forensic Laboratory, South Charleston, West Virginia

Daniel T. Radcliffe, Florida Department of Law Enforcement, Daytona Beach, Florida

Sandra B. Sachs, Office of the Chief Medical Examiner, San Francisco, California

A. J. "Skip" Schwoeble, RJ Lee Group, Inc., Monroeville, Pennsylvania

Ila Simmons, South Carolina Law Enforcement Division, Columbia, South Carolina

Jenny Smith, Missouri State Highway Patrol Forensic Laboratory, Jefferson City, Missouri

David W. Spence, Southwestern Institute of Forensic Crime Laboratory Services, Dallas, Texas

Faye Springer, Sacramento County District Attorney, Sacramento, California

James N. Stam, San Diego Police Department, San Diego, California

Michael A. Trimpe, Hamilton County Coroner's Office, Cincinnati, Ohio

Dennis C. Ward, FBI Laboratory, Quantico, Virginia

Geoffrey Warman, Forensic Science Service, London, England

Robert S. White, Legal Science, Charleston, West Virginia

Thomas R. White, Texas Department of Public Safety Crime Laboratory Service, Austin, Texas

Diana M. Wright, FBI Laboratory, Quantico, Virginia

EXHIBIT E

SEM Primer Gunshot Residue Report Wording Guidelines

Report wording for PGSR analysis has not been standardized by those performing the procedure. Nor does ASTM make any recommendation as to how the results are to be presented. Several sources were taken into consideration when formulating the wording for the findings and conclusions to be used in reports.

1) Current PGSR report wording from the atomic absorption spectroscopy procedure being performed in the laboratory in an attempt to provide similarities between the two procedures and make the transition from one report to the other easy to understand.
2) Input from the written SEM/PGSR procedure used by the Department of the Coroner for the County of Los Angeles in Los Angeles, California.
3) Discussions with thirteen other forensic scientists who currently perform the procedure.

Particle Classification

Unique Particle Classification

Unique particles should possess a molten appearance and may contain nodules adhering to the surface, surface bright spots, layers and various surface textures. While these particles are best identified as spheroids, PGSR particles may have irregular shapes that are a result of impact fracture. The primary elemental composition that defines a particle as being primer gunshot residue is a combination of barium, antimony and lead or barium and antimony. A particle must have one of these elemental combinations to be considered unique PGSR. Many other elements (Si, Ca, Al, Fe, Sr, Cu, Zn, S, Sn, K, Cl, Na and Mg while Ni, P and Co will be rare) may also be present in the particle along with the previously mentioned combinations. It is also important that at least one of the primary elements be a major component of the particle composition. Thus, BaSb or PbBaSb compositions set PGSR particles apart from other environmental type particles which may exhibit similar morphologies. Particles containing high levels of sulfur or any level of titanium are not to be considered as unique PGSR type.

Consistent Particle Classification

Consistent particles are classified when combinations of the primary elements such as PbBa, PbSb, Sb, Ba, Pb are present. Several other compositions will fit into this classification because of the new Pb free ammunition that is being manufactured. They will primarily be Sr rich or a combination of Ti/Zn and should be spheroidal. Particles containing titanium are to be considered consistent PGSR type only when present with zinc.

Sample Stub Characterization

Unique and Consistent

For this category there must be at least three unique particles and a variety of consistent particles which have been identified on the stub. Contained within the consistent particles there should be at least one Lead-Antimony particle. The load factors (particles per square millimeter analyzed) can vary. There does not appear to be any relationship between the number of unique and consistent particles detected. The numbers and types of particles can be affected by the ammunition type.

Consistent

This category will contain less than three unique particles and a variety of consistent particles. There must be a significant number of consistent particles such that the load factor is 3.75 or greater. The majority of these particles will probably be of the Lead rich type unless the ammunition used is .22 caliber or the new Lead free type. The Lead free ammunition will produce either Strontium, Calcium or Titanium/Zinc particles.

Hand Background

Hand backgrounds are a result of encountering materials through the course of daily life. Occupation can play a major role in the types of particles that are deposited on the hands and may affect whether we choose consistent or hand background. For a stub to be classified as hand background it can contain any type of particle including PGSR type particles. However, the load factor of the PGSR type particles must be less than 3.75.

Contaminated

If analysis of the samples reveals that the kit control sample contains unique and/or consistent PGSR particles then there is an indication of potential contamination and no conclusion can be made with respect to the samples. A load factor of 3.75 or greater must be used with respect to consistent type particles.

Criteria	Findings
Negative Control	Sample ##C was not contaminated with PGSR type particles.
Positive Control	Sample ##C was contaminated with PGSR type particles.
Both samples negative	All samples in Exhibit ## were examined by scanning electron microscopy and contain particles characteristic of hand backgrounds.
One positive for uniques and one negative	All samples in Exhibit ## were examined by scanning electron microscopy. Sample ## contains unique and consistent PGSR particles while sample ## contains particles characteristic of hand backgrounds.
One positive for uniques and one for consistents	All samples in Exhibit ## were examined by scanning electron microscopy. Sample ## contains unique and consistent PGSR particles while sample ## contains consistent PGSR type particles.
Both samples positive	All samples in Exhibit ## were examined by scanning electron microscopy. Samples ##A and ##B contain unique and consistent PGSR particles.
Both samples consistent	All samples in Exhibit ## were examined by scanning electron microscopy. Samples ##A and ##B contain consistent PGSR type particles.
Negative Control	No statement needed
Positive Control	Due to contamination of the control, no conclusions may be drawn from samples ##A and ##B.
Both samples negative	The results of samples ##A and ##B indicate that the subject may not have discharged a firearm with either hand. If the subject did discharge a firearm, then the particles were removed by activity or were not detected by the procedure.

Criteria	Conclusions
One positive for uniques and one negative	The results of sample ## indicate that the subject discharged a firearm, handled a PGSR related item or had the rt/lt hand in the environment of a discharged firearm while the results of sample ## indicate that the subject may not have discharged a firearm with rt/lt hand.
One positive for uniques and one for consistents	The results of sample ## indicate that the subject discharged a firearm, handled a PGSR related item or had the rt/lt hand in the environment of a discharged firearm while the results of sample ## indicate that the subject may have discharged a firearm or handled a PGSR related item with the rt/lt hand or received the particles from an environmental source.
Both samples positive	The results of samples ## and ## indicate that the subject discharged a firearm, handled a PGSR related item or had both hands in the environment of a discharged firearm.
Both samples consistent	The results of samples ## and ## indicate that the subject may have discharged a firearm or handled a PGSR related item with the rt/lt hand or received the particles from an environmental source.

EXHIBIT F

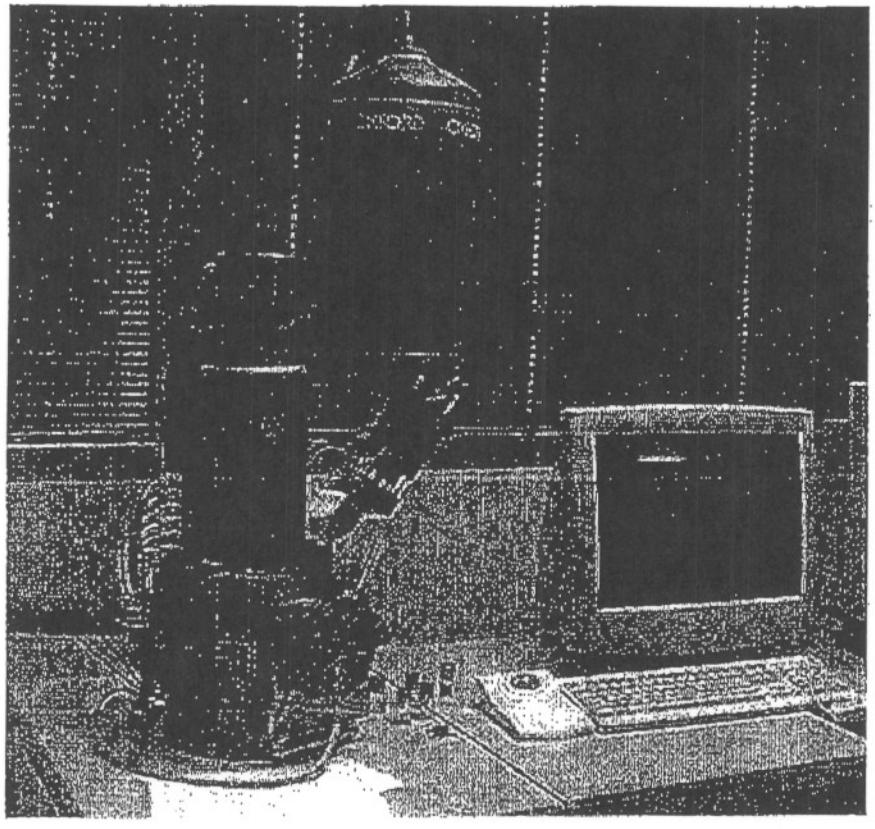
WEST VIRGINIA STATE POLICE
LABORATORY FIELD MANUAL
8th Edition

Gunshot Residue Results

Locating and identifying GSR means that particles that are created during a firearm discharge have come in contact with a surface or surfaces. This can occur either by the direct deposition of the particles from the smoke cloud at the time of discharge or by the handling of objects which contain GSR

The quantity and location of the particles usually have no bearing on the circumstances during the incident. Finding GSR does not necessarily mean that it was the sampled subject that pulled the trigger.

The lack of GSR does not exonerate a person.



Scanning Electron Microscope (SEM)

EXHIBIT C

STATE OF MINNESOTA DISTRICT COURT

COUNTY OF ANOKA TENTH JUDICIAL DISTRICT

State of Minnesota,

Plaintiff,

v.

Jason Moua,

Defendant.

FILED

JUL 07 2006

Jane F Morrow
Court Administration
Anoka County, MN
Deputy

ORDER

Court File No.: K5-05-7335

The defendant filed its Motion to Suppress Gun Shot Residue Evidence on May 31, 2005. On December 16, 2005 the defendant filed a motion for a Frye-Mack Hearing to determine the admissibility of the State's gunshot residue evidence. On March 6, 2006 and March 7, 2006, the Court held a Frye-Mack hearing on the admissibility of the evidence. At the hearing, the State was represented by Michele Davis and Nancy Norman, Assistant Anoka County Attorneys, 2100 Third Avenue, Anoka, Minnesota 55303. The defendant was represented by Paul Schneck and Patrick Sullivan, Assistant Hennepin County Public Defenders, 317 Second Avenue South, Suite 200, Minneapolis, Minnesota 55401.

At the close of the Frye-Mack hearing on March 7, 2006, the Court ordered the parties to submit written briefs regarding suppression of the evidence. Both the defendant's and the State's briefs were filed on May 1, 2006. Accordingly, the Court took this matter under advisement as of the filing of the last written submission on May 1, 2006.

Based upon the arguments of counsel, all the files, records, and proceedings herein, the Court hereby issues the following:

ORDER

1. Defendant's Motion to Suppress Gun Shot Residue evidence is **GRANTED**.
2. The attached memorandum is incorporated into this Order.
3. The Court Administrator shall notify the parties of this Order by mailing copies to the parties' attorneys, whose names and addresses appear above.

BY THE COURT:

Dated: 7/7/06

Sharon L. Hall
Judge of District Court
Tenth Judicial District

MEMORANDUM

Background

The defendant is charged by indictment for the deaths of Bunsean Lieng and Tashi Sonam Jagottsang, and injuries to Tenzin Tsondu, Tenzin Phelgye Woser, Tenzin Tenpa, and Tenzin Choegyal. Specifically, the defendant was indicted for Counts I and III, Aiding and Abetting First-Degree Murder pursuant to Minn. Stat. § 609.185(a)(1), and § 609.05, Subds. 1, 2; Counts II and IV, Aiding and Abetting First-Degree Murder for the Benefit of a Gang pursuant to Minn. Stat. § 609.185(a)(1), § 609.05, Subds. 1, 2, and § 609.229; Counts V through VIII, Aiding and Abetting Attempted First-Degree Murder pursuant to Minn. Stat. § 609.185(1), § 609.17, and § 609.05, Subds. 1, 2; Counts IX through XII, Aiding and Abetting Attempted First-Degree Murder for the Benefit of a Gang pursuant to Minn. Stat. § 609.185(1), § 609.17, § 609.05, Subds. 1, 2, and § 609.229.

The defendant's indictment was based in part on the following facts. On February 3, 2005, Columbia Heights police officers were dispatched to Jimmy's Pro Billiards shortly after 10:00 p.m. on a report of a fight between approximately twenty Asian individuals, which had resulted in gunfire. Upon arriving at the parking ramp behind the pool hall, Columbia Heights Police Officer Gregory Sinn observed a body lying next to a pool stick on the ground in the lower level of the parking ramp. Almost immediately thereafter, Officer Sinn heard three very rapid gunshots, and believed them to be coming from the east side of the ramp or the adjoining alleyway. While radioing that there was a body down and shots were being fired, Officer Sinn observed a black, four-door Honda quickly exit the parking ramp through the entrance without its lights on. Believing the vehicle's occupants might be involved in the shootings, Officer Sinn notified other officers that the car should be stopped.

After receiving the dispatch that police were looking for a dark Honda-type vehicle possibly containing Asian males, Columbia Heights Police Officer Matthew Aish observed a black, four-door Honda, containing at least three occupants, driving toward him where he was sitting in a parked squad. Officer Aish followed the Honda, observed the Honda commit several traffic violations, and ultimately stopped the vehicle. The driver of the vehicle was identified as Jason Moua, the front seat passenger as Helene Yang,[1] and the rear seat passenger as Meng Vang. The three individuals were transported to the Columbia Heights Police Department. At the scene of the stop, the officers did not take gunshot residue (hereafter, "GSR") samples, nor did the officers bag the individuals' hands to preserve potential GSR before transporting them to the police department.

Columbia Heights Police Officer Robert Harvey also responded to the area of Jimmy's Pro Billiards after receiving Officer Sinn's dispatch. From his location near the pool hall, Officer Harvey observed a blue Honda Civic hatchback, containing an Asian male driver with at least three occupants in the vehicle driving toward him on 40th Avenue. Because the vehicle and its driver matched the general description provided by dispatch, Officer Harvey began to follow the vehicle. The officer stopped the vehicle after observing the occupants engage in furtive conduct. Upon stopping the vehicle, Officer Harvey identified the driver as Sai Vang, the front seat passenger as Charles Yang, and the rear seat passenger as Grogan Yang. The individuals from Officer Harvey's stop were also transported to the Columbia Heights Police Department. Officers did not take GSR samples of these individuals, or bag the individuals' hands to preserve potential GSR before transporting them from the scene.

[1] Jason Moua and Helene Yang are married and reside together at 3910 Sheridan Avenue North, Hennepin County, Minnesota.

Columbia Heights Police Reserve Officer Craig Stachowski was called to the Columbia Heights Police Department some time between 10:00 p.m. and 10:30 p.m. to assist with the detention of the suspects from the two traffic stops as well as other individuals detained for further investigation. When he arrived, Officer Stachowski observed a total of nine individuals handcuffed, sitting on a bench and on the floor in the hallway of the police station. Officer Stachowski was instructed by Officer Harvey to watch over the detainees to insure that they did not speak to each other.

While being detained and before any forensics samples were taken, each of the detainees asked to use the restroom. Before each went into the restroom, their handcuffs were removed, they were patted down, and they were searched for weapons. Officer Stachowski then entered the single-stall restroom with each suspect in order to observe each from behind.[2] Officer Harvey specifically instructed the suspects to be sure to wash their hands after using the bathroom.

After the male suspects went to the bathroom, Officer Stachowski observed each wash his hands thoroughly. Officer Stachowski specifically observed Jason Moua pull his sleeves up to his elbows, and scrub his hands, arms, forearms and face thoroughly. He observed Meng Vang scrub his hands and about half of his forearms. Officer Stachowski stated that Sai Vang and Grogan Yang washed their hands as well, but not as thoroughly as Jason Moua and Meng Vang. Finally, he observed Charles Yang scrub his hands very thoroughly and wash his face as well.

After the detainees used the restroom and washed their hands thoroughly, Deputy Jeffrey Olson of the Anoka County Sheriff's Office Crime Lab arrived at the station to conduct the GSR

[2] Officer Stachowski did not accompany Helene Yang into the restroom. Instead, a female reserve officer observed Helene Yang.

sampling. He observed the nine detainees handcuffed in the narrow hallway and saw that some of their hands were touching. Frye-Mack Transcript, 248-49; 268-69. Before any GSR sampling began, three of the nine original detainees were released. Id. at 130-31; 255. Detective Brian Fuerst apparently uncuffed and brought each of the remaining six detainees one-by-one into a room found by Deputy Olson. See id. at 251-52. The detainees hands were not bagged. Deputy Olson testified that he selected a meeting room with a large conference table that was relatively clean in which to conduct the GSR sampling. Id. at 215-16.

Deputy Olson followed the same GSR collection procedure for each detainee. Deputy Olson first took close-up photographs of each detainee's hands, having the detainees place their hands together and then place them on the table. Id. at 265. He photographed each hand separately, but did not reglove for the second hand. Id. at 265-66. After photographing each detainee's hands, Deputy Olson put on a clean pair of rubber gloves before taking GSR samples using a Lynn Peavy GSR trace evidence collection kit. See id. at 218-20. After taking the GSR samples, Deputy Olson put on new gloves and then asked each individual to disrobe and place each piece of clothing in a separate plastic bag. See id. Deputy Olson did not put on a pair of new rubber gloves before taking the detainees' clothing bags. Id. The deputy did, however, wipe down the table with a dry paper towel between the sampling of each individual in order to "minimize the possibilities of contamination from that table between individuals." Id.[3]

Deputy Olson testified that Jason Moua's sample was taken at 1:45 a.m.; Meng Vang's sample at 2:15 a.m.; Sai Vang's sample at 2:30 a.m.; Helene Yang's sample at 3:10 a.m.; Charles Yang's sample at 3:45 a.m.; and Grogan Yang's sample at 4:25 a.m. Frye-Mack Transcript, 233.

[3] Deputy Olson later testified that in hindsight, he considered that using a wet rag might have been more effective in cleaning the table. See Frye-Mack Transcript, 264.

After the GSR samples were taken, the samples were sent to the R.J. Lee Group, Inc. in Monoreville, PA for GSR testing.

Deputy Olson testified that Dective Fuerst was in the room during the GSR sampling of at least the first two detainees. Id. at 237-38. Deputy Olson acknowledged transfer of GSR particles was certainly possible, but believed he did what he could under the circumstances. He did not know until several days later from the police reports that some of the detainees had washed their hands prior to being tested.

GSR Testing and Analysis

Alfred J. Schwoeble of the R.J. Lee Group conducted an analysis and interpretation of the GSR samples. Mr. Schwoeble submitted a report containing the results of his analysis on March 8, 2005. See Frye-Mack Transcript, 41-86; see also GSR Report. Mr. Schwoeble's report contains the following results and/or conclusions.

1. Co-Defendant Jason Moua

On the back of Moua's right hand, there was 1 total unique particle, 2 characteristic particles, and 108 lead-rich[4] particles detected. Id. at 66; see also GSR Report, 2c. On Moua's right palm, there was 1 unique particle, 4 characteristic particles, and 59 lead-rich particles. GSR Report, 2c. On the back of Moua's left hand, there were 3 unique particles, 14 characteristic particles, and 113 lead-rich particles. Id. On Moua's left palm, there were 2 unique particles, 11 characteristic particles, and 77 lead-rich particles.

As to Jason Moua, the report concludes, "Particles confirmed as unique to or characteristic of GSR could have resulted from the discharge of a firearm, or being in proximity

[4] Mr. Schwoeble testified, "...[l]ead's the most abundant element in the mix, and generally you would find more lead particles than you do the other combinations." Frye-Mack Transcript, 66. Therefore, Mr. Schwoeble explained it is important to note how many lead particles are detected because it gives an idea of an area on a sample where there would be heavy deposits of gunshot residue.

to a discharging firearm. Handling of contaminated firearms and/or ammunition components can also contribute to the presence of particles unique to or characteristic of GSR."[5] GSR Report, 2f.

2. Co-Defendant Meng Vang

On the back of Meng Vang's right hand, there were 3 total unique particles, 5 characteristic particles, and 127 lead-rich particles detected. GSR Report, 2d. On Meng Vang's right palm, there were 8 unique particles, 12 characteristic particles, and 102 lead-rich particles. GSR Report, 2d. On the back of Meng Vang's left hand, there were 2 unique particles, 7 characteristic particles, and 43 lead-rich particles. Id. On Meng Vang's left palm, there were 3 unique particles, 8 characteristic particles, and 102 lead-rich particles. Id.

As to Meng Vang, the report concludes, "Particles confirmed as unique to or characteristic of GSR could have resulted from the discharge of a firearm, or being in proximity to a discharging firearm. Handling of contaminated firearms and/or ammunition components can also contribute to the presence of particles unique to or characteristic of GSR."[6] GSR Report, 2f.

3. Co-Defendant Sai Vang

On Sai Vang's left palm, there was 1 unique particle, 6 characteristic particles, and 39 lead-rich particles detected. Id. at 2d. The report concludes:

> There were no particles classified as unique to gunshot residue found on VANG, Sai Right Back, Right Palm and Left Back (RJ Lee Group Samples 1007300-02). The results of the analysis of these samples must be termed inconclusive. However, on the Right Back, Right Palm and Left Back samples, there were small populations of particles similar to the particles classified as characteristic on the Left Palm (RJ Lee Group Samples 1007303) sample.

GSR Report, 2f.

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[5] The GSR Report includes this same provision in the conclusion section for each individual. For some of the individuals, there are additional conclusory statements following this provision. However, this provision comprises the entire conclusions for Co-Defendants Jason Moua and Meng Vang.

[6] See id.

4. **Helene Yang**

On Helene Yang's right palm, there were 3 total unique particles, 35 characteristic particles, and 105 lead-rich particles detected. GSR Report, 2d. On the back of Helene Yang's left hand, there were 3 unique particles, 12 characteristic particles, and 39 lead-rich particles. Id. On Helene Yang's left palm, there were 2 unique particles, 17 characteristic particles, and 79 lead-rich particles. Id.

The report concludes:

> There were no particles classified as unique to gunshot residue found on YANG, Helene Right Back (RJ Lee Group Sample 1007304). The results of the analysis of this sample must be termed inconclusive. However, on the Right Back sample, there were small populations of particles similar to the particles classified as characteristic on the Right Palm, Left Back and Left Palm (RJ Lee Group Samples 1007305-07) samples.

GSR Report, 2g.

5. **Co-Defendant Charles Yang**

On the back of Charles Yang's right hand, there were 2 total unique particles, 10 characteristic particles, and 46 lead-rich particles detected. Id. at 2e. On Charles Yang's right palm, there was 1 total unique particle, 13 characteristic particles, and 68 lead-rich particles detected. Id. The report concludes:

> There were no particles classified as unique to gunshot residue found on YANG, Charles Left Back and Left Palm (RJ Lee Group Samples 1007310-11). The results of the analysis of these samples must be termed inconclusive. However, on the Left Back and Left Palm samples, there were small populations of particles similar to the particles classified as characteristic on the Right Back and Right Palm (RJ Lee Group Samples 1007308-09) samples.

GSR Report, 2g.

6. **Co-Defendant Grogan Yang**

On Grogan Yang's right palm, there were greater than 100 total unique particles, greater than 80 characteristic particles, and greater than 600 lead-rich particles detected. Id. at 2e. On the back of Grogan Yang's left hand, there were 19 total unique particles, 30 characteristic particles, and 126 lead-rich particles detected. Id. On Gorgan Yang's left palm, there were 15 total unique particles, 15 characteristic particles, and 141 lead-rich particles detected. Id. at 2f.

The report concludes:

> There were no particles classified as unique to gunshot residue found on YANG, Grogan Right Back (RJ Lee Group Sample 1007312). The results of the analysis of this sample must be termed inconclusive. However, on the Right Back sample, there were small populations of particles similar to the particles classified as characteristic on the Right Palm, Left Back and Left Palm (RJ Lee Group Samples 1007313-15) samples.

GSR Report, 2g.

Frye-Mack Hearing

On March 6, 2006 and March 7, 2006, the Court conducted a Contested Omnibus, or Frye-Mack hearing, regarding the GSR evidence obtained pursuant to the investigation of this matter. At that hearing defense attorney Patrick Sullivan specifically stated the issue before the Court:

> Mr. Sullivan: . . . the issue is whether among the community of experts and the relevent [sic] scientific community, which would be gunshot residue experts, whether they would support the conclusion based on the test results that a person fired a gun, was near a gun when it was fired, or handled a gun shortly after it was fired, as is in the report, and as was submitted to the grand jury. We say it only means that you're in an environment of gunshot residue. And not only do a hundred percent of the gunshot residue experts agree with that, apparently the State's expert does too. Which at [sic] point they didn't know when they filed a motion.
>
> Now as to Prong 2, reliability, we have the same sort of thing. A hundred percent of gunshot residue experts will say that you should take the test as soon as possible, not four hours later after a bunch of activity occurred, including washing hands, et cetera. Which we'll elicit from the witness stand. And so those

> are the issues which are important, and are in fact they are being studied by an FBI committee right now, we just don't know the result yet.
>
> The Court: And I hate to misspeak, but it's my understand [sic] that that issue is that the test results are, could be so flawed that this evidence should not even get to the jury.
>
> Mr. Sullivan: Yes. Our experts say "I have no confidence that it's possible to associate the GSR on the stubs taken from Jason Moua to a specific shooting incident that occurred earlier." That's what he's saying. And that's, I believe we'll have to see what Mr. Schwoeble says about that.

Frye-Mack Transcript, 33-36. The Court then heard testimony from Alfred J. Schwoeble, director of the forensic science department at the R.J. Lee Group, Inc., Deputy Jeffrey Olson, Anoka County Sheriff's Office Crime Lab, and defense expert John Kilty, a retired FBI agent who had been chief of the agency's GSR unit and is now a self-employed forensic science consultant.

Before testifying, Mr. Schwoeble was qualified as an expert in GSR analysis, with no objection from defense counsel. Id. at 48. Mr. Schwoeble proceeded to testify that he used a Scanning Electron Microscope to perform the testing of the samples taken in this case. Id. at 56-62. He explained that the Scanning Electron Microscope is used to find particles of lead, barium, and antimony, which are all components of GSR. Id. at 50-51. While conducting GSR testing, the tester specifically looks for particles that are unique to or characteristic of GSR. Mr. Schwoeble explained:

> Particles confirmed as unique to or characteristic of GSR could have resulted from the discharge of a firearm, being in proximity to a discharging firearm, handling of contaminated firearms and/or ammunition components can also contribute to the presence of particles unique to and characteristic of gunshot residue, or other surfaces.

Id. at 71.

Assistant Anoka County Attorney Michele Davis questioned Mr. Schwoeble further:

Ms. Davis:	When you perform your gunshot residue analysis and you come to the conclusion that there are particles unique to gunshot residue or particles characteristic of gunshot residue, does that mean that a person fired a handgun or firearm?
Mr. Schwoeble:	We can never say who fired the gun.
Ms. Davis:	You indicated in your report as part of your conclusions that somebody could get gunshot residue on their hands a number of different ways; is that correct?
Mr. Schwoeble:	Yes, ma'am.
Ms. Davis:	You didn't indicate in your report that gunshot residue could come from transfer or from some other surface?
Mr. Schwoeble:	That would be other sources, yes.
Ms. Davis:	And why didn't you indicate that in your report?
Mr. Schwoeble:	I don't know.
Ms. Davis:	If you were to –
Mr. Schwoeble:	**It's – it's my fault because we were placing that in the body of the text, and I neglected it.**
Ms. Davis:	**You're not disputing here today though that the gunshot particles you found on each of these individuals may have in fact come from some other surface other than firing a gun, being in close proximity to a gun, or handling contaminated ammunition?**
Mr. Schwoeble:	**Correct.**

Id. at 74-75 (emphasis added).

Mr. Schwoeble also testified concerning a book he published in 2000 about GSR analysis. Id. at 46. He stated that in his book, he wrote that the presence of GSR simply means that a person was in an environment of GSR. Id. at 75. A person who was "in an environment of

GSR" means that the person was somewhere where GSR was present. Id. Mr. Schwoeble stated that several variables can affect the presence of GSR such as fans blowing, open windows and doors, and other causes of turbulent air movement. Id. at 76.

In addition, Mr. Schwoeble testified that GSR analysis cannot determine when GSR is deposited on a surface. Id. at 75-76. He explained that GSR can be transferred by touching a surface that had GSR. Id. at 85. For example, GSR can transfer when a person touches one hand to another hand, a hand to his or her face, a hand to his or her hair, a hand to the surface of a car, or touches another person who has GSR on them. Id. at 85-91. Mr. Schwoeble further explained that a person who fires a gun or is present when a gun is fired could potentially transfer GSR to a car or to another person, and that GSR could be transferred by the police to a person's hands when they are handcuffed. Id. He also stated that GSR could fall off clothing onto the floor or a bench, and that a police officer who then pats down a suspect or removes his or her handcuffs could transfer GSR to the hands of the handcuffed suspect, or to other suspects in turn. Id. at 126-27, 132-35.

Mr. Schwoeble also testified that GSR particle loss can result from cleansing of the hands, hands going in and out of pockets, wiping, washing, or any other physical activity where your hands are touching something while moving. Id. at 76-77. He testified that it is possible for a person to remove all GSR from his or her hands by washing and subsequently pick up GSR after washing by touching another contaminated object. Id. at 127-28. Mr. Schwoeble acknowledged it is therefore not good police procedure to instruct suspects to wash their hands before sampling them for GSR. Id. at 129-30.

Mr. Schwoeble specifically testified that it is possible for a handcuffed person's hands to become contaminated with GSR in the back seat of a police vehicle. Id. at 108. Mr. Schwoeble

stated that the consensus of the GSR scientific community is that GSR sampling should be done at the scene. Id. at 107-08. If subjects cannot be sampled before being placed in a police vehicle, it is recommended that officers bag the suspects' hands to prevent additional contamination. Id.

Mr. Schwoeble also testified concerning the contents of his GSR report. His report determined that there were particles unique to GSR on the hands of Co-Defendants Jason Moua, Meng Vang, Sai Vang, Charles Yang, and Grogan Yang, and on the hands of Helene Yang, who is not a party as to this matter. Id. at 63-73. Mr. Schwoeble testified concerning the specific number of particles found at each sample location on the hands of each of the co-defendants, as contained in his report. Frye-Mack Transcript, 65-73; see also infra at 5 (including excerpts from the GSR Report).

Defense expert John Kilty testified at the Frye-Mack hearing on behalf of Jason Moua. In preparation for his testimony, Mr. Kilty reviewed the GSR report submitted by Alfred Schwoeble. Although he testified concerning Mr. Schwoeble's conclusion specifically pertaining to Jason Moua, Mr. Kilty reviewed the testing analysis printout on all six of the individuals tested. Id. at 335-36. Mr. Kilty also reviewed transcripts of the officers who testified at the grand jury proceeding concerning the processing of all six individuals. Id. at 341-42.

Mr. Kilty testified that after thoroughly reviewing the GSR report as well as the officers' grand jury testimony, he disagreed with Mr. Schwoeble's conclusion as it is specifically articulated in the GSR Report. Id. at 340-42. Mr. Kilty disagreed that the GSR evidence indicated the defendant was near a gun when it was fired, fired a gun, or handled ammunition. Mr. Kilty stated the following concerning the report's conclusion specifically pertaining to Co-Defendant Jason Moua:

Mr. Kilty: . . . I don't believe that that is a properly worded conclusion based on findings of particles analysis.

Mr. Sullivan: Do you think there were sufficient particles found to say that this was gunshot residue or could be?

Mr. Kilty: Well it is gunshot residue, there's no doubt about that. It's the meaning of that, is where I had the problem. And it demonstrated to me that the person was in an environment of gunshot residue. I think a total of I think there was seven or eight particles on total particles of gunshot residue on all the aspects of the man's hands. That demonstrates this person was in an environment of gunshot residue.

Mr. Sullivan: What about the opinion of RJ Lee that he was near a gun when it was fired or fired a gun or handled ammunition; that sort of thing?

* * *

Mr. Kilty: Well I don't think that the scientific finding supports that. Because there's so many ways that this person could have gotten gunshot primer residue on his hands between the shooting. Let's assume he was in the environment when the shots occurred. To the point where he was sampled, to include that transcription of a conversation over the telephone, that an officer had with another officer, who witnesses this man washing his hands in a bathroom in the Columbia Heights police department. It just made it so that I simply could not associate these particles of gunshot residue with the shooting in question.

Id. at 340-41. Mr. Kilty testified that in this particular case, based on the multiple problems with the sampling procedure, he would not have swabbed the defendants' hands in the first place. Id. at 381-82. He identified some of the sampling problems as: (1) the lapse of time from the defendants' arrest to when the samples were taken; (2) the transfer of clothing; (3) the defendants being in the same room together; (4) the defendants riding in squad cars; and (5) the defendants washing their hands. Id. at 381-83.

ISSUES

The test the trial court must apply in determining the admissibility of novel scientific evidence is the two-prong Frye-Mack standard. Goeb v. Theraldson, 615 N.W.2d 800, 809-10 (Minn. 2000). First, a novel scientific technique must be generally accepted in the relevant scientific community (hereafter "Prong 1"), and second, the particular evidence derived from that test must have a foundation that is scientifically reliable (hereafter, "Prong 2"). Id. at 810. The proponent of scientific evidence has the burden to establish the proper foundation for the admissibility of the test by showing that the methodology used is reliable and in the particular instance produced reliable results. Id. at 816 (quoting State v. Moore, 458 N.W.2d 90, 98 (Minn. 1990)). In addition, the evidence must satisfy the requirements of Minnesota Rules of Evidence 402 and 702, be relevant, be given by a witness qualified as an expert, and be helpful to the trier of fact. See State v. Nystrom, 596 N.W.2d 256, 259 (Minn. 1999).

1. **Prong 1: Is GSR testing and analysis generally accepted within the relevant scientific community?**

In its Memorandum of Law in Opposition to Defendant's Motion to Suppress Gunshot Residue Evidence, the State contends that the defendant does not dispute the general acceptance of GSR testing and analysis in the relevant scientific community because the defendant does not contest the science surrounding the Scanning Electron Microscope.[7] State Mem., 10. The State asserts, "defense counsel stipulated at the beginning of the hearing on March 6, 2005, [sic] that they were not contesting the science or chemistry underlying GSR testing." Id. At the Frye-Mack hearing on March 6, 2006 defense attorney Mr. Sullivan stated, "We're not challenging the chemistry or the scanning electronic [sic] microscope." Frye-Mack Transcript, 25.

[7] See also Frye-Mack Transcript, 61 (containing Alfred J. Schwoeble's testimony that the use of Scanning Electron Microscopes are widely accepted in the relevant scientific community, and that the microscope is considered the most efficient method of analysis for gunshot residue).

After listening to the testimony at the hearing and upon this Court's review of the parties' written submissions, the Court concludes that, despite the State's claim to the contrary, there are legitimate Prong 1 concerns regarding the general acceptance of GSR testing and analysis in the relevant scientific community. [8]

As clearly stated in his memorandum, the defendant does not dispute the use of the Scanning Electron Microscope used in this case, nor does the defendant argue the presence of particles of GSR on the defendant's hands. See Def. Mem., 14. However, the defendant argues that there is no general acceptance in the scientific community regarding **the number of unique particles** sufficient to support an opinion that the presence of GSR was caused by firing a gun, being present when a gun was fired, or handling contaminated guns or ammunition. Id. (emphasis added). Some laboratories have established standards that require from three to ten unique particles to be present to draw the conclusion that a person discharged or handled a firearm. Id. The defendant argues, "There is no evidence that reporting out results with as little as one particle per test stub [as in the case with Jason Moua] is generally accepted in the scientific community." Id. Therefore, the defendant argues, the very small amount of GSR taken from his hands cannot support the conclusion that the defendant fired a gun, was near a gun when it was fired, or handled contaminated guns or ammunition in this case. Id. at 9.

[8] The State contends that because the defendant does not dispute the chemistry or the use of the Scanning Electron Microscope in this case, the defense does not contest the testing methods used by the State's expert and therefore has no Prong 1 issues. State Mem., 13 (stating that for this reason, "The defense reliance on Goeb is misplaced."). The Court does not agree. The defendant has made clear that he does not contest the methodology or procedures used in general GSR testing. However, in Goeb, the court specifically held, "The proponent of scientific evidence has the burden to establish the proper foundation for the admissibility of the test by showing that the methodology used is reliable **and in the particular instance produced reliable results.**" Goeb v. Theraldson, 615 N.W.2d 800, 816 (Minn. 2000) (quoting State v. Moore, 458 N.W.2d 90, 98 (Minn. 1990) (emphasis added)). The defendant cites Goeb for his claim that the methodology used in this case did not produce **reliable results** because there is no general acceptance in the relevant scientific community regarding the number of unique particles sufficient to support an opinion that the presence of GSR was caused by firing a gun, being present when a gun was fired, or handling contaminated guns or ammunition. Def. Mem., 14 (emphasis added). Accordingly, this Court's reading of Goeb concurs with the defendant's analysis.

The defendant's expert, John Kilty, testified that the number of particles on a person's hands simply cannot determine whether that person fired a gun or got it from transference. Frye-Mack Transcript, 375. Mr. Kilty stated that the greater number of particles found on an individual's hands lends to a greater chance that the individual was associated with the particular event under investigation but that the number of particles on a person cannot determine whether that person handled a firearm or ammunition or picked up the particles from a secondary source such as a squad car, handcuffs, or another person. Id. Mr. Kilty emphasized the scientific community's concern with the problems associated with secondary transference of particles – namely, potentially misleading test results which report the presence of GSR particles. Id. 373. Mr. Kilty testified that in order to eliminate the problem of secondary transference, some police labs have increased the threshold number of particles necessary for their labs to conclude that a person fired gun, was near a gun when it was fired, or handled contaminated guns or ammunition. Id.

This Court is not convinced the relevant scientific community has a generally accepted standard for interpreting what conclusions can be drawn from GSR testing and analysis. Based on the testimony of both the State's expert and the defendant's expert, it is clear that significant questions exist in the relevant scientific community concerning how many particles are required for there to be a positive test. It is also clear that scientists agree the results will not determine if a person fired a gun, was present when a gun was fired, or handled contaminated guns or ammunition.[9] The scientists agree a positive test will only conclude a person has been in the environment of gunshot residue.

[9] See Frye-Mack Transcript, 111-12 (containing Alfred Schwoeble's testimony that the relevant scientific community has no consensus on when to accept a GSR case, what to call a particle, how to write a GSR report, acceptance criteria of samples . . .); see also id. at 183-87 (containing Alfred Schwoeble's testimony that there is a

Based on the foregoing, this Court finds the State has not satisfied Prong 1 of the Frye-Mack standard because there is no accepted scientific standard regarding the number of particles that must be present for the test to be positive. Despite this conclusion, this Court will also analyze Prong 2, as the Court believes that Prong 2 is also dispositive of this matter. C.f. Goeb, 615 N.W.2d at 815 (stating, ". . . we need not decide what the generally accepted methodology should be because the second prong of the Frye-Mack standard is dispositive here.").

2. **Prong 2: Does the GSR testing performed in this case have scientifically reliable foundation?**

In order to establish foundational reliability, the proponent of the test must establish 1) that the test itself is reliable; and 2) that the test's administration in the particular case conformed to the procedure necessary to ensure reliability. Goeb v. Theraldson, 615 N.W.2d 800, 814 (Minn. 2000). Furthermore, the Minnesota Supreme Court has held, "The proponent of scientific evidence has the burden to establish the proper foundation for the admissibility of the test by showing that the methodology used is reliable **and in the particular instance produced reliable results**." Goeb, 615 N.W.2d at 816 (citing State v. Moore, 458 N.W.2d 90, 98 (Minn. 1990); State v. Dille, 258 N.W.2d 565, 567 (Minn. 1977) (emphasis added)).

The defendant argues, "The state has clearly not met it's [sic] burden of showing that the methodology used here was reliable and that the test produced reliable results." Def. Mem., 15. He points to several undisputed facts that render the test results untrustworthy, such as the use of handcuffs, the transportation of the defendants in squad cars, the number of individuals detained together in close proximity, the lack of decontamination measures, and the opportunity for secondary transference between defendants. Id. at 16-17.

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wide variety of standards in crime labs across the country as to the number of particles required to make a positive call regarding the presence of GSR).

In response, the State contends, ". . . the State has shown in the present case that the particular evidence derived from [the] test has a foundation that is scientifically reliable." State Mem., 10. The State asserts that when conducting the GSR sampling, Deputy Olson wore gloves while taking the samples, changed gloves between each suspect, and wiped the table with a paper towel after each suspect left the room. Id. at 11. The State additionally claims that in performing the analysis of the samples, Mr. Schwoeble followed "standard operating procedures [that] are used across the country in other labs he has visited." Id. The State argues that the evidence is reliable because the Scanning Electron Microscope used by the R.J. Lee Group was properly calibrated, the samples were handled under sterile conditions with the use of lab coats and gloves, and all the samples were secured with evidence tape and were contained in intact vials. Id.

Despite the State's assertions, this Court concludes that the State has not met its burden of establishing that the administration of the tests in this case conformed to the procedures necessary to ensure reliability. As the State's own expert testified, GSR particles can be transferred between individuals by someone touching a surface containing GSR particles or by having contact with an individual who fired a gun or was present when a gun was fired. Frye-Mack Transcript, 63-77, 85-91, 126-30, 107-08. GSR particles can even be picked up by an individual as a result of the particles falling off the clothing of someone who handled a gun or was nearby when a gun was fired. Id. at 135. In light of the foregoing and upon review of all the facts of the GSR collection, this Court cannot find the test results reliable in this case.

First, a large number of people were present during the shootings and some of these individuals admitted firing guns themselves or being present when guns were fired. Officers did not take GSR samples of the five individuals involved in the two traffic stops at the scene of the

stops and failed to take any measures to preserve possible GSR evidence by bagging the suspects' hands before handcuffing and transporting them to the police station in squad cars. The defendant was in a car with two individuals who admitted either firing a gun or being present when a gun was fired and nine individuals who were believed to be present during the shootings were kept together in a small hallway with some of their hands touching – all these factors creating an increased opportunity for transference of GSR particles between the suspects.

Furthermore, all the defendants were permitted to use the restroom and ordered to wash their hands before GSR testing began. The defendant, in particular, was observed scrubbing his hands and arms up to his elbows before being tested. As the State's own expert testified, it is possible for a person to remove all GSR from his or her hands by washing and subsequently pick up GSR after washing by touching another contaminated object. Id. at 127-28.

These facts, along with the facts that: (1) Deputy Olson wiped down the table using a dry, rather than dampened, paper towel after each individual was tested; (2) each individual tested was permitted to wear the same clothes they wore when arrested; (3) Deputy Olson did not put on a clean pair of rubber gloves before sampling the second hand; (4) Detective Fuerst uncuffed each defendant before the sampling; and (5) several hours passed between the shooting and the sampling - all of these factors and many more not specifically mentioned here contribute to the unreliability of the samples in this case.

The State argues, "Despite Defendant's arguments to the contrary, Mr. Schwoeble stated that the collection procedures and the physical activity are not necessarily relevant in determining whether GSR in [sic] present on a swab because 'what's there is there.'" State Mem., 11. This Court disagrees. There is no question that the procedures the officers followed to collect the samples weigh heavily on the issue of the reliability of the samples. The collection

procedures and physical activity are clearly relevant, contrary to the State's contention. As the State's own expert testified, the GSR particles found on each defendant might have come from some other surface and not from firing a gun, being in close proximity to a gun that was fired, or handling a gun or ammunition, especially considering the defendants could have completely removed any GSR particles by washing their hands. See Frye-Mack Transcript, 74-75. Therefore, the R.J. Lee Group's strict compliance with "standard operating procedures" is immaterial if proper GSR preservation measures were not employed by the officers. The irregularities of the collection procedure resulted in an analysis of samples with meaningless conclusions.

This Court finds that the State has not satisfied Prong 2 of the Frye-Mack standard. The State has not met its burden of establishing the proper foundation for the admissibility of the GSR testing and analysis in that the State has not shown that the methodology used was reliable and in this particular instance produced reliable results, as required by Goeb. Accordingly, the Court grants the defendant's motion to suppress evidence of GSR. Although the Court's analysis could end here, this Court will next address whether GSR evidence would be helpful to the trier of fact in this case.

3. **Would the GSR evidence be helpful to the trier of fact?**

The Minnesota Rules of Evidence provide, "If scientific, technical, or other specialized knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue, a witness qualified as an expert by knowledge, skill, experience, training, or education, may testify thereto in the form of an opinion or otherwise." Minn. R. Evid. 702. Expert testimony under this rule is generally admitted if it is helpful. See State v. Bradford, 618 N.W.2d 782, 793

(Minn. 2000) (citing State v. Helterbridle, 301 N.W.2d 545, 547 (Minn. 1980)). The Minnesota Supreme Court has stated:

> The basic requirement of Rule 702 is the helpfulness requirement. If the subject of the testimony is within the knowledge and experience of a lay jury and the testimony of the expert will not add precision or depth to the jury's ability to reach conclusions about that subject which is within their experience, then the testimony does not meet the helpfulness test.

Helterbridle, 301 N.W.2d 545, 547 (Minn. 1980). The supreme court has held that admission of an expert's opinion generally rests within the discretion of the trial court and will not be reversed absent an apparent error. State v. Myers, 359 N.W.2d 604, 609 (Minn. 1984); see also Helterbridle, 301 N.W.2d at 547 ("The trial court has broad discretion in deciding whether testimony by a qualified expert should be received.").

The district court must also consider Minnesota Rules of Evidence Rule 403 when determining the admissibility of expert testimony. State v. Blanche, 696 N.W.2d 351, 373 (Minn. 2005) ("Even if acceptable under Rule 702, expert testimony should be excluded if its probative value is substantially outweighed by the danger of unfair prejudice."). Rule 403 provides, "Although relevant, evidence may be excluded if its probative value is substantially outweighed by the danger of unfair prejudice, confusion of the issues, or misleading the jury, or by considerations of undue delay, waste of time, or needless presentation of cumulative evidence." Minn. R. Evid. 403.

The defendant argues that the admission of Mr. Schwoeble's testimony regarding the GSR report and the conclusions contained in the report is inadmissible under both Rules 702 and 403. Def. Mem., 19-20. The defendant claims, "There is a substantial risk of unfair prejudice, confusion, and of misleading the jury if the State is permitted to introduce this evidence." Id. at 19. The defendant contends that the admission of Mr. Schwoeble's testimony about the GSR test

would not be helpful to the trier of fact, and would mislead the jurors as to the ability of the GSR test to identify the actual shooters. Id.

In response, the State argues the GSR evidence should be admitted because the evidence is relevant and probative. State Mem., 13-14. The State contends:

> Not only is this evidence admissible it is also relevant. . . . Both experts agree that GSR analysis can determine if a person was in an environment of GSR. Both experts agreed that in this case the defendant's [sic] had GSR particles on their hands and were found to be in an environment of GSR. Defense expert Mr. Kilty went further to say that GSR evidence is valuable if you have a person found near a shooting scene and they are denying any involvement in firearms. Tr. Pg. 384. That is precisely the situation we have in the present case. Consequently not only is the GSR evidence admissible it is relevant and probative.

Id. The State goes on to assert that an expert's opinion on what finding GSR on a person means is ultimately a question of weight, best left for the trier of fact at trial. Id. at 13.

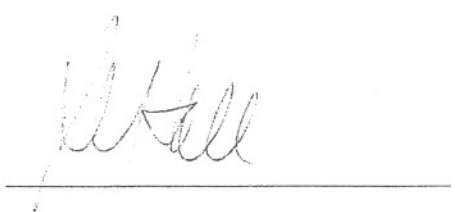
However, the State does not discuss why this Court should admit Mr. Schwoeble's testimony under Rule 702, and fails to articulate how the testimony would "add precision or depth" to the jury's ability to reach a conclusion as to whether in this particular case the defendant fired a gun or was near a gun when it was fired. In addition, the State's Memorandum does not address the defendant's Rule 403 argument that the probative value of the GSR evidence is substantially outweighed by the danger of misleading the jury with the GSR report's conclusions.

As both Mr. Schwoeble and Mr. Kilty testified, there have been such remarkable advances in GSR science that, to date, all that the "presence of particles unique to gunshot residue" can categorically prove is that an individual was in an environment where GSR was present. As both experts testified, this encompasses an extremely broad range of possible ways an individual can pick up GSR particles. The countless ways in which the defendant could pick up GSR could cause the trier of fact to speculate as to its source. This Court does not believe that the GSR

evidence presented in this case would add any precision or depth to the jury's ability to conclude whether or not the defendant fired a gun, was present when a gun was fired, handled a gun or ammunition, or picked up the GSR from the back of a squad car, a police officer's hands, the bench in the police department's hallway, from another person detained in that hallway, from the restroom, from the conference table, from the handcuffs, or from any other source not mentioned here. Therefore, the Court finds the GSR evidence is inadmissible under Rules 702 and 403 as well as it has no probative value for the trier of fact.

CONCLUSION

There is no accepted standard within the relevant scientific community regarding the number of particles necessary for GSR analysis to be positive. Proper procedures for the GSR sampling of these defendants were not followed. The State will be unable to lay proper foundation for their admissibility at trial. A positive test result will only indicate a person is in an environment of GSR, which makes this evidence not helpful to the trier of fact. The Court therefore grants the defendant's motion to exclude any evidence of gunshot residue.



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